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Space Administration
Langley Research Center

Scientific and Technical
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WHAT'S INSIDE

NASA STI Program ... in Profile

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- Domestic and foreign dissertations and theses

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The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at http://www.uspto.gov/patft/.

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Mathematical and Computer Sciences

Physics

Social and Information Sciences

Space Sciences

General

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for linking to the corresponding document citation from *NASA Thesaurus* terms and personal author names.

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 43, AUGUST 12, 2005

01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see *categories 02 through 09*. For information related to space vehicles *see 12 Astronautics*.

20050192475 NASA Langley Research Center, Hampton, VA, USA
Doppler Global Velocimetry Measurements for Supersonic Flow Fields
Meyers, James F.; [2005]; 19 pp.; In English; Advanced Measuring Techniques for Supersonic Flows, 28 Feb. - 3 Mar. 2005, Brussels, Belgium
Contract(s)/Grant(s): 23-065-10-91; No Copyright; Avail: CASI; A03, Hardcopy

The application of Doppler Global Velocimetry (DGV) to high-speed flows has its origins in the original development of the technology by Komine et al (1991). Komine used a small shop-air driven nozzle to generate a 200 m/s flow. This flow velocity was chosen since it produced a fairly large Doppler shift in the scattered light, resulting in a significant transmission loss as the light passed through the Iodine vapor. This proof-of-concept investigation showed that the technology was capable of measuring flow velocity within a measurement plane defined by a single-frequency laser light sheet. The effort also proved that velocity measurements could be made without resolving individual seed particles as required by other techniques such as Fringe- Type Laser Velocimetry and Particle Image Velocimetry. The promise of making planar velocity measurements with the possibility of using 0.1-micron condensation particles for seeding, Dibble et al (1989), resulted in the investigation of supersonic jet flow fields, Elliott et al (1993) and Smith and Northam (1995) - Mach 2.0 and 1.9 respectively. Meyers (1993) conducted a wind tunnel investigation above an inclined flat plate at Mach 2.5 and above a delta wing at Mach 2.8 and 4.6. Although these measurements were crude from an accuracy viewpoint, they did prove that the technology could be used to study supersonic flows using condensation as the scattering medium. Since then several research groups have studied the technology and developed solutions and methodologies to overcome most of the measurement accuracy limitations:
Derived from text
Laser Doppler Velocimeters; Doppler Effect; Supersonic Speed; Supersonic Jet Flow; Flow Velocity; Flow Distribution

20050196757 Budapest Univ. of Technology and Economics, Budapest, Hungary
Proceedings of the 8th Mini Conference on Vehicle System Dynamics, Identification and Anomalies
Zobory, I.; January 2002; 710 pp.; In English; Mini Conference on Vehicle System Dynamics, Identification and Anomalies (8th)., November 11 - 13, 2002, Budapest (Hungary)
Report No.(s): PB2005-107445; No Copyright; Avail: CASI; A99, Hardcopy

The Budapest VSDIA Mini Conference series on Vehicle System Dynamics, Identification and Anomalies began in 1988 on the basis of the initiative of the academic staff members of the Faculty of Transportation Engineering dealing with railway vehicle, road vehicle, aerospace vehicle, as well as ship dynamics and control at the Technical University of Budapest. The rapid development in this special field and the great interest of industrial/transport enterprises in the intensive research and development made it reasonable to think of widening the possibilities in Central Europe for the international exchange of views and experience on dynamics, identification and parameter anomaly problems of vehicle systems.
NTIS
Anomalies; Conferences; Hungary; System Identification

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also *34 Fluid Mechanics and Thermodynamics*.

20050188665 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Study in Drag Reduction of Close Formation Flight Accounting for Flight Control Trim Positions and Dissimilar Formations
Morgan, Michael T.; Mar. 2005; 130 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434312; AFIT/GAE/ENY/05-M13; No Copyright; Avail: CASI; A07, Hardcopy

This thesis further defines the position of greatest fuel savings benefit for the trail aircraft flying in a two-ship formation. The HASC95 vortex lattice code was used for the examination. Investigations of a similar formation of F-16 aircraft and a dissimilar formation of a lead KC-135 aircraft and a trail F-16 aircraft were conducted. The analyses determined the effects of varying airspeed on the optimal position. In addition, flight control surface deflections were taken into account during the analyses. Both investigations trimmed the aircraft in the yaw and roll axes to determine the optimal savings. The similar analysis was conducted at an altitude of 20,000 feet and three airspeeds: cruise speed of 300 knots, maximum range airspeed of 271 knots, and maximum endurance airspeed of 211 knots. The savings for the trail aircraft were determined to be 16%, 21%, and 34%, respectively, at a constant wing tip overlap of 13.5% of the wingspan. The dissimilar formation was completed at an altitude of 20,000 feet and 300 knots airspeed. This resulted in a 26% savings for the trail aircraft with a wing tip overlap of 16.7% of its wingspan. A flight test was flown for the similar formation profile of F-16s. The flight test investigated the change in vertical positioning and lateral spacing from the first analysis and captured data at 300 knots. The results of the flight test were inconclusive. However, the determined area of apparent savings was bounded by 7.9% to 19.9% wing tip overlap and -3.2% to -7.3% vertical separation. At the bounds, fuel savings of 12% and 13% +/-7% were observed. The drag savings profile had the capability to increase the range of existing airframes, providing the benefit at no cost. The analytical study was conducted at the Air Force Institute of Technology, Wright-Patterson AFB. The flight test was conducted at the U.S. Air Force Test Pilot School, Edwards AFB, California.
DTIC
Aircraft Pilots; Airspeed; Drag Reduction; Flight Control; Formation Flying; Fuel Consumption; Optimization

20050192561 George Washington Univ., Washington, DC, USA
Program of Research in Flight Dynamics, The George Washington University at NASA Langley Research Center
Murphy, Patrick C., Technical Monitor; Klein, Vladislav; [2005]; 11 pp.; In English
Contract(s)/Grant(s): NCC1-03004; No Copyright; Avail: CASI; A03, Hardcopy

The program objectives are fully defined in the original proposal entitled Program of Research in Flight Dynamics in GW at NASA Langley Research Center, which was originated March 20, 1975, and in the renewals of the research program from January 1, 2003 to September 30, 2005. The program in its present form includes three major topics: 1. the improvement of existing methods and development of new methods for wind tunnel and flight data analysis, 2. the application of these methods to wind tunnel and flight test data obtained from advanced airplanes, 3. the correlation of flight results with wind tunnel measurements, and theoretical predictions.
Derived from text
Wind Tunnel Tests; Aerodynamics; Research Projects; Mathematical Models; Flight Characteristics

20050194597 Bureau of Industry and Security, Washington, DC, USA
National Security Assessment of the U.S. Aerial Delivery Equipment Industry. A Joint Assessment with U.S. Army Soldier Biological and Chemical Command
January 2005; 96 pp.; In English
Report No.(s): PB2005-107382; No Copyright; Avail: CASI; A05, Hardcopy

Since their first major deployment in 1942, parachutes have been an important tool in the arsenal of the USA armed forces, enabling the delivery of troops and equipment to inaccessible locations with speed and often with surprise. Following the initial use of parachutes in World War II for large-scale troop deployments, the technology evolved rapidly to support a broad range of aerial delivery systems for cargo and other payloads. The technological and manufacturing base of the air delivery systems used by the armed forces is now many decades old and is well established. The U.S. military relies on these systems not only in times of conflict, but also for assisting in humanitarian relief operations around the globe. In recent years, however,

the Department of Defense (DOD) has experienced some problems in timely delivery of parachute orders from industry and has been concerned about the ability of the U.S. Army to procure parachute systems quickly in a time of national need. A detailed assessment of the health and competitiveness of the industry, specifically addressing its ability to meet future DOD needs, was requested by the U.S. Army Soldier Biological and Chemical Command (SBCCOM), a subordinate unit of the U.S. Army Materiel Command (AMC). The U.S. Department of Commerce, Bureau of Industry and Security, was asked to conduct the assessment.
NTIS
Air Cargo; Air Drop Operations; Aircraft Equipment; Delivery; Industries; Security

20050196086 Defence Science and Technology Organisation, Victoria, Australia
A Review of Australian and New Zealand Investigations on Aeronautical Fatigue During the Period April 2003 to March 2005
Clark, Graham; May 2005; 84 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434937; DSTO-TN-0624; DODA-AR-013-387; No Copyright; Avail: Defense Technical Information Center (DTIC)

This document has been prepared for presentation to the 29th Conference of the International Committee on Aeronautical Fatigue scheduled to be held in Hamburg, Germany, 6th and 7th June 2005. Brief summaries and references are provided on the aircraft fatigue research and associated activities of research laboratories, universities, and aerospace companies in Australia and New Zealand during the period April 2003 to March 2005. The review covers fatigue related research programs as well as fatigue investigations on specific military and civil aircraft.
DTIC
Aeronautical Engineering; Australia; New Zealand

20050196639 Georgia Tech Research Inst., Atlanta, GA, USA
The Application of Pneumatic Aerodynamic Technology to Improve Drag Reduction, Performance, Safety, and Control of Advanced Automotive Vehicles
Englar, Robert J.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 957-995; In English; See also 20050196628; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Blown aircraft aerodynamic technology has been developed and applied to entrain separated flow fields, significantly reduce drag, and increase the fuel economy of Heavy Vehicles and Sports Utility Vehicles (SUVs). These aerodynamic improvements also lead to increases in stability, control, braking, and traction, thus enhancing safety of operation. Wind-tunnel results demonstrating model Heavy Vehicle drag coefficient reductions of up to 84% due to blowing and related configuration improvement are reviewed herein. Tunnel data confirming the elimination of directional instability due to side-winds plus generation of aerodynamic forces which are not currently used for control of large vehicles are also shown. These data have guided the design and modification of a full-scale road-test vehicle. Initial confirmation road test results of this patented concept on the modified blown HV rig are presented. An SAE Type-II Fuel Economy test was also conducted. Here, various blowing configurations were tested, and results were compared to a baseline reference tractor-trailer to confirm the improved fuel economy due to blowing. Full-scale wind-tunnel tests of this pneumatic technology applied to a GM Suburban SUV were also conducted, and the positive effects of blowing for drag reduction, vehicle aerodynamic stability, and operational safety are shown. Comparative results presented include wind-tunnel data for both unblown and blown configurations, full-scale blowing and fuel-economy data, and comparisons to smaller-scale blown Pneumatic Heavy Vehicle experimental results.
Author
Aerodynamic Forces; Aerodynamic Stability; Motor Vehicles; Pneumatics; Flow Distribution; Drag Reduction

20050196641 Army Research Lab., Aberdeen Proving Ground, MD, USA
Time-Accurate Simulations of Synthetic Jet-Based Flow Control for a Spinning Axisymmetric Body
Sahu, Jubaraj; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 689-721; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes a computational study undertaken to determine the aerodynamic effect of tiny unsteady synthetic jets as a means to provide the control authority needed to maneuver a spinning projectile at low subsonic speeds. Advanced Navier-Stokes computational techniques have been developed and used to obtain numerical solutions for the unsteady jet-interaction flow field at subsonic speeds and small angles of attack. Unsteady numerical results show the effect of the jet

on the flow field and on the aerodynamic coefficients. The unsteady jet is shown to substantially alter the flow field both near the jet and the base region of the projectile that in turn affects the forces and moments even at zero degree angle of attack. The results have shown the potential of computational fluid dynamics to provide insight into the jet interaction flow fields and provided guidance as to the locations and sizes of the jets to generate the maximum control authority to maneuver a projectile to hit its target with precision.
Author
Axisymmetric Bodies; Computational Fluid Dynamics; Unsteady Flow; Angle of Attack; Aerodynamic Coefficients; Flow Distribution

20050196643 Georgia Tech Research Inst., Atlanta, GA, USA
Aerodynamic Heat Exchanger: A Novel Approach to Radiator Design using Circulation Control
Gaeta, R. J.; Englar, R. J.; Blaylock, G.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 997-1021; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

GTRI has recently been developing pneumatic aerodynamic concepts for application to Heavy Vehicles under a Department of Energy contract through the Oak Ridge National Laboratory (ORNL). A related application under development is a novel heat exchanger known as the Aerodynamic Heat Exchanger (AHE). This patented device employs airfoil/wing aerodynamic pressure differences to induce large mass flows across a radiator installed inside a wing. GTRI has recently completed an in-house wind tunnel test of this concept. The objective of this proposed effort was to perform a wind-tunnel evaluation of the AHE and establish the feasibility of the concept. A 2D wing was fabricated with a removable center section. A radiator core was integrated into this section of the wing. A conventional radiator core (based on a Visteon design) and two cores made from carbon foam were tested. The carbon foam cores were designed and provided to GTRI by ORNL. Hot water was allowed to pass through the inside of the wing while freestream, wind tunnel air passed over (and through) the wing. Heat rejected by the radiator was measured as well as lift and drag. Results indicated that the concept is feasible and can provide an effective means to reduce vehicle drag by reducing the drag due to conventional radiators.
Author
Pneumatics; Aerodynamic Heating; Heat Exchangers; Airfoils; Mass Flow; Free Flow; Drag Reduction

20050196658 QSS Group, Inc., Cleveland, OH, USA
Vortex Rings Generated by a Shrouded Hartmann-Sprenger Tube
DeLoof, Richard L., Technical Monitor; Wilson, Jack; July 2005; 20 pp.; In English; 35th Fluid Dynamics Conference and Exhibit, 6-9 Jun. 2005, Toronto, Ontario, Canada
Contract(s)/Grant(s): NAS3-00145; WBS 22-708-03-05
Report No.(s): NASA/CR-2005-213576; AIAA Paper 2005-5163; E-15041-2; No Copyright; Avail: CASI; A03, Hardcopy

The pulsed flow emitted from a shrouded Hartmann-Sprenger tube was sampled with high-frequency pressure transducers and with laser particle imaging velocimetry, and found to consist of a train of vortices. Thrust and mass flow were also monitored using a thrust plate and orifice, respectively. The tube and shroud lengths were altered to give four different operating frequencies. From the data, the radius, velocity, and circulation of the vortex rings was obtained. Each frequency corresponded to a different length to diameter ratio of the pulse of air leaving the driver shroud. Two of the frequencies had length to diameter ratios below the formation number, and two above. The formation number is the value of length to diameter ratio below which the pulse converts to a vortex ring only, and above which the pulse becomes a vortex ring plus a trailing jet. A modified version of the slug model of vortex ring formation was used to compare the observations with calculated values. Because the flow exit area is an annulus, vorticity is shed at both the inner and outer edge of the jet. This results in a reduced circulation compared with the value calculated from slug theory accounting only for the outer edge. If the value of circulation obtained from laser particle imaging velocimetry is used in the slug model calculation of vortex ring velocity, the agreement is quite good. The vortex ring radius, which does not depend on the circulation, agrees well with predictions from the slug model.
Author
Hartmann-Sprenger Tubes; Vortex Rings; Shrouds; Unsteady Flow

20050196736 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Aircraft Accident Report: Hard Landing, Gear Collapse, Federal Express Flight 647, Boeing MD-10-10F, N364FE, Memphis, Tennessee, on December 18, 2003
May 17, 2005; 122 pp.; In English
Report No.(s): PB2005-910401; NTSB/AAR-05/01; No Copyright; Avail: CASI; A06, Hardcopy

This report explains the accident involving Federal Express flight 647, a Boeing MD-10-10F N364FE, which crashed while landing at Memphis International Airport (MEM), Memphis, Tennessee. Safety issues in this report focus on flight crew performance, emergency evacuations, MEM air traffic control and aircraft rescue and firefighting issues, and flight data recorder reliability.
NTIS
Accident Investigation; Collapse; Hard Landing; Landing Gear; Safety; Safety Management; Transportation

20050198856 NASA Langley Research Center, Hampton, VA, USA
Turbulent Vortex-Flow Simulation Over a 65 deg Sharp and Blunt Leading-Edge Delta Wing at Subsonic Speeds
Ghaffari, Farhad; July 2005; 47 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WU 23-762-45-UG
Report No.(s): NASA/TM-2005-213781; L-19140; No Copyright; Avail: CASI; A03, Hardcopy

Turbulent thin-layer, Reynolds-Averaged Navier-Stokes solutions, based on a multi-block structured grid, are presented for a 65 deg delta wing having either a sharp leading edge (SLE) or blunt leading edge (BLE) geometry. The primary objective of the study is to assess the prediction capability of the method for simulating the leading-edge flow separation and the ensuing vortex flow characteristics. Computational results are obtained for two angles of attack of approximately 13 and 20 deg, at free-stream Mach number of 0.40 and Reynolds number of 6 million based on the wing mean aerodynamic chord. The effects of two turbulence models of Baldwin-Lomax with Degani-Schiff (BL/DS) and the Spalart-Allmaras (SA) on the numerical results are also discussed. The computations also explore the effects of two numerical flux-splitting schemes, i.e., flux difference splitting (fds) and flux vector splitting (fvs), on the solution development and convergence characteristics. The resulting trends in solution sensitivity to grid resolution for the selected leading-edge geometries, angles of attack, turbulence models and flux splitting schemes are also presented. The validity of the numerical results is evaluated against a unique set of experimental wind-tunnel data that was obtained in the National Transonic Facility at the NASA Langley Research Center.
Author
Computational Fluid Dynamics; Navier-Stokes Equation; Boundary Layer Separation; Delta Wings; Flow Characteristics; Separated Flow; Turbulence Effects; Vortices; Multiblock Grids; Structured Grids (Mathematics); Subsonic Speed

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety* and *85 Technology Utilization and Surface Transportation*.

20050188563 Joint Chiefs of Staff, Washington, DC USA
Joint Doctrine for Airspace Control in the Combat Zone
Aug. 2004; 94 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434108; JCS-JP-3-52; No Copyright; Avail: CASI; A05, Hardcopy

This publication provides broad doctrinal guidance for joint forces involved in the use of airspace over the combat zone and contiguous areas. Airspace control as described in this publication includes the varied airspace of the combat zone foreign continent, high seas, amphibious objective area, littoral, or the North American Continent outside the USA, as well as contiguous areas such as the communications zone. Airspace control as described in this publication applies to the broadest interpretation of areas where combat forces are required to conduct operations, including operations other than war. The inherent nature of air operations demands strict compliance with terrestrial boundaries. Therefore, airspace control functions must ensure smooth transition from noncombat air traffic control to integrated air operations in the combat zone.
DTIC
Airspace; Combat

20050188604 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Parachute Extraction of a Generic Store from a C-130; a CFD Proof of Concept
Platt, Stephen C.; Mar. 2005; 87 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434226; AFIT/GAE/ENY/05-M17; No Copyright; Avail: CASI; A05, Hardcopy

This thesis encompasses a feasibility analysis of a parachute extracted generic precision guided munition from the cargo

bay of a C-130 aircraft in flight. This analysis utilizes the USAF Beggar code and incorporates full physics effects as well as aerodynamic loading assuming an inviscid aircraft and viscous store for a time-accurate solution. Both an immediate and time varying application of the parachute force are utilized as well as two different ordnance body styles at zero and 5 degrees AOA with the store placed on centerline and offset in the cargo bay. The time accurate parachute model is based on empirical data and more closely follows the force fall off as the parachute slows down during the extraction process. Both store body styles were successfully extracted from the cargo bay without contacting any portion of the delivery aircraft, following a safe trajectory down and away from all of the release conditions. The extraction took 1.7 seconds with the immediate application of the parachute force and 2.1 seconds when the time varying model was applied. The maximum roll seen during an extraction was 13 degrees, which was the largest movement on any axis.
DTIC
Computational Fluid Dynamics; Extraction; Parachutes

20050188770 Army Research Inst. for the Behavioral and Social Sciences, Fort Rucker, AL USA
Cohesion in Sports and Organizational Psychology: An Annotated Bibliography and Suggestions for U.S. Army Aviation (1993 to 2003)
Grice, Robert L.; Katz, Lawrence C.; Apr. 2005; 106 pp.; In English
Contract(s)/Grant(s): Proj-A790
Report No.(s): AD-A434528; ARI-TR-1159; No Copyright; Avail: CASI; A06, Hardcopy

Cohesion has long been a core concept in psychology and sociology, and has garnered a great deal of attention by both Organizational and Sports Psychology in the past decade. Although the U.S. Army has increasingly viewed cohesion as a key to the success of combat operations, a comprehensive review of the cohesion literature yielded few studies specifically addressing the construct in military rotary=wing aircrews. The purpose of this review was to examine the Organizational and Sports Psychology bodies of literature from the past decade to identify a set of characteristics associated with cohesive teams that can readily be applied to the Army rotary-wing aviation environment. The primary characteristics gleaned from this research are summarized, and a 4-dimension description of cohesion is presented. Suggestions for building cohesive Army aviation units are offered. In addition, an annotated bibliography of the key studies from which these dimensions emerged is provided.
DTIC
Annotations; Bibliographies; Cohesion; Psychology

20050192474 NASA Langley Research Center, Hampton, VA, USA
Pilot Preference, Compliance, and Performance With an Airborne Conflict Management Toolset
Doble, Nathan A.; Barhydt, Richard; Krishnamurthy, Karthik; [2005]; 6 pp.; In English; 2005 (13th) International Symposim on Aviation Psychology, 18-21 Apr. 2005, Oklahoma City, OK, USA
Contract(s)/Grant(s): 23-137-10-10; Copyright; Avail: CASI; A02, Hardcopy

A human-in-the-loop experiment was conducted at the NASA Ames and Langley Research Centers, investigating the En Route Free Maneuvering component of a future air traffic management concept termed Distributed Air/Ground Traffic Management (DAG-TM). NASA Langley test subject pilots used the Autonomous Operations Planner (AOP) airborne toolset to detect and resolve traffic conflicts, interacting with subject pilots and air traffic controllers at NASA Ames. Experimental results are presented, focusing on conflict resolution maneuver choices, AOP resolution guidance acceptability, and performance metrics. Based on these results, suggestions are made to further improve the AOP interface and functionality.
Author
Pilot Performance; Air Traffic Controllers (Personnel); Air Traffic Control; Autonomy; Test Pilots

20050194685 Lawrence Livermore National Lab., Livermore, CA USA
Approach to Estimate the Localized Effects of an Aircraft Crash on a Facility
Kimura, C. Y.; Sanzo, D. L.; Sharirli, M.; Apr. 2004; 20 pp.; In English
Report No.(s): DE2005-15014106; UCRL-CONF-203793; No Copyright; Avail: Department of Energy Information Bridge

Aircraft crashes are an element of external events required to be analyzed and documented in facility Safety Analysis Reports (SARs) and Nuclear Explosive Safety Studies (NESSs). This paper discusses the localized effects of an aircraft crash impact into the Device Assembly Facility (DAF) located at the Nevada Test Site (NTS), given that the aircraft hits the facility. This was done to gain insight into the robustness of the DAF and to account for the special features of the DAF that enhance its ability to absorb the effects of an aircraft crash. For the purpose of this paper, localized effects are considered to be only

perforation or scabbing of the facility. This paper presents an extension to the aircraft crash risk methodology of Department of Energy (DOE) Standard 3014. This extension applies to facilities that may find it necessary or desirable to estimate the localized effects of an aircraft crash hit on a facility of nonuniform construction or one that is shielded in certain directions by surrounding terrain or buildings.
NTIS
Crashes; Aircraft Accidents; Test Facilities

20050195902 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA
Global Air Mobility Advanced Technologies (GAMAT) Advanced Technology Development (ATD) Phase II Research and Development
Kuper, Samuel R.; Scott, Ronald; Kazmierczak, Thomas; Roth, Emilie; Whitaker, Randall; May 2004; 146 pp.; In English
Contract(s)/Grant(s): F33601-03-F-0064; Proj-4923
Report No.(s): AD-A434607; AFRL-HE-WP-TR-2005-0023; No Copyright; Avail: CASI; A07, Hardcopy

This is the final report documenting the AFRL/HEC effort entitled Global Air Mobility Advanced Technologies (GAMAT) in its 'Phase II' period. The Phase II effort was undertaken as an extension and expansion of the GAMAT Phase I effort. This demonstration capability was developed under the Air Force Research Laboratory Human Effectiveness Directorate's Global Air Mobility Advanced Technologies (GAMAT) Advanced Technology Development (ATD) research and development program. The goal of the GAMAT ATD was to further the development of a new type of user interface technology called Work-Centered Support System (WCSS) technology. The U.S. Air Force's Air Mobility Command's command and control environment was used as the domain for development, testing and refinement of WCSS theories and technology applications. Work-Centered Support System (WCSS) technology is a new cognitive-science-based analysis and design methodology for developing human-computer interfaces and client applications that enable very high user productivity, especially in dynamic and information dense environments. The WCSS technology is applicable to any domain and leverages cognitive analyses and advanced user interface design techniques to provide 'intuitive' user interfaces and client applications customized based on the work requirements. The analysis and design approach is designed to support rapid user adaptation to both routine and non-routine/unexpected events.
DTIC
Cognition; Command and Control; Human-Computer Interface; Mobility; Support Systems

20050196188 Air Force Academy, CO USA
Aerospace Power in Urban Warfare: Beware the Hornet's Nest
Hunt, Peter C.; May 2001; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435089; No Copyright; Avail: Defense Technical Information Center (DTIC)

This is the 39th volume in the Occasional Paper series of the U.S. Air Force Institute for National Security Studies (INSS). Aerospace power has emerged as a primary military instrument of choice in pursuing national objectives within the complex international security environment entering the 21st century. Changes in the security landscape, the dynamics of sub-theater conflicts, and coalition imperatives combine to place new requirements on aerospace operational planning and the conduct of aerospace operations themselves. Occasional Papers 38 and 39 address, in turn, both political and operational dimensions of aerospace power application today. They are presented both for informational and educational purposes to offer informed perspectives on important aspects of contemporary aerospace operations, to generate informed discussion and to bound productive debate on aerospace power in both supported and supporting roles. In Occasional Paper 38, 'Constraints, Restraints, and the Role of Aerospace Power in the 21st Century,' Jeffrey Beene presents a comprehensive examination of the use of aerospace power within tightly restrained conflicts and suggests improvements in doctrine, training, and tools to more effectively employ such power within that environment. In this Occasional Paper, 'Aerospace Power in Urban Warfare: Beware the Hornet's Nest,' Peter Hunt examines the employment of aerospace power in the increasingly important urban operational environment. Aerospace technologies and systems offer alternatives and important adjuncts to surface forces in the urban arena, but significant obstacles and critical considerations must be brought into planning for such operations. Each of these aspects of aerospace power demands greater thought and analysis, and these two occasional papers are presented to help focus that attention.
DTIC
Aerospace Systems; Military Operations; Warfare

20050196253 Industrial Coll. of the Armed Forces, Washington, DC USA
Transportation Industry 2004
Miller, Evan; Kathir, Nathan; Brogan, Dennis M.; Jan. 2004; 32 pp.; In English
Report No.(s): AD-A435197; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents a strategic-level examination of the transportation industry -- an industry vital to national prosperity and security. Because the defense sector relies on commercial transportation for both peacetime activities and for power projection, senior military leaders must understand the global transportation industry and the environment in which the private sector operates. They must also assess the role of government in determining transportation policy, as federal, state, and local agencies regulate every mode of this industry. While the U.S. transportation industry functions well today, the industry must address several challenges, particularly in light of forecasts that global trade will double by 2020. Issues common across all modes of transportation include the growth of intermodal transport, the capital-intensive nature of the industry structure, the need to carefully focus technological investment, planning for infrastructure capacity, replacing an aging workforce, and coping with uncertain fuel costs. Security concerns following the terrorist attacks of September 11 require transportation leaders to regularly conduct risk assessments and provide additional security when warranted. These initiatives have been prudently balanced with the need to provide reliable, cost-effective transportation to fuel the economic engine of the USA. After defining the industry in terms of each of the five different modes (i.e.,shipping, trucking, railroads, air, and pipelines), this report reviews the industry's current conditions, challenges, outlook, and government roles and regulations. Also included are three essays on subjects current to the industry: Aviation Treaties, Short Sea Shipping, and Tanker-Civil Reserve Air Fleet (CRAF). Given what the authors learned firsthand from government and private industry leaders, they conclude that the U.S. transportation industry is generally in good health and should remain so for the foreseeable future. 7
DTIC
Economics; Forecasting; Industries; Policies; Security; Transportation; United States

20050196276 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Three Dimensional Helmet Mounted Primary Flight Reference for Paratroopers
Thompson, Jason I.; Mar. 2005; 144 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435253; AFIT/GCS/ENG/05-18; No Copyright; Avail: Defense Technical Information Center (DTIC)

This thesis seeks to develop a Heads Up Display (HUD) presented on a Helmet Mounted Display (HMD), which presents a three-dimensional, graphical, predictive navigational reference to a paratrooper during a High Altitude, High Opening (HAHO) parachute jump. A Path Generating Algorithm (PGA) takes as input the Landing Zone's (LZ) location, the wind profile, and the paratrooper's parachute's performance characteristics, and returns a set of waypoints for the paratrooper to follow. The PGA attempts to maximize the distance that the paratrooper travels. The PGA's output is used to build a path to the LZ from a Release Point (RP). During the jump, GPS signals and an Inertial Measurement Unit functioning as a head tracker is used to determine the user's location and head orientation. The HUD presents a virtual 'Tunnel in the Sky' for the paratrooper to navigate through. Due to hardware unavailability, the head tracker could not be implemented. Ground testing of the system sans the head tracker determined that subjects using the graphical HUD navigated a path slower than when compared to a baseline navigational reference. It is theorized that implementing the head tracker will make the HUD more efficient and better suited to navigation.
DTIC
Algorithms; Display Devices; Flight Paths; Helmet Mounted Displays; Helmets; Navigation

20050196672 NASA Glenn Research Center, Cleveland, OH, USA
Safer Aircraft Possible With Nitrogen Generation
Palaszewski, Bryan A.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A system named On-Board Inert Gas Generation System/On-Board Oxygen Generation System (OBIGGS/OBOGS) was studied with Boeing. The study established the requirements for nitrogen purge (for fuel tank inerting and cargo compartment fire suppression) and oxygen (for passengers and crew). The nitrogen would be used for suppressing fires and fuel tank explosions on the aircraft, and the oxygen would be used for breathing gas during high-altitude or emergency operations.
Derived from text
Aircraft Safety; Nitrogen; Aircraft Equipment; Oxygen Production; Purging

20050196673 NASA Glenn Research Center, Cleveland, OH, USA

Safer Aviation Materials Tested

Palaszewski, Bryan A.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A series of thermally stable polymer samples were tested. These materials are called low heat release materials and are designed for aircraft interior decorative materials. The materials are designed to give off a minimum amount of noxious gases when heated, which increases the possibility that people can escape from a burning aircraft. New cabin materials have suitably low heat release so that fire does not spread, toxic chemicals are not given off, and the fire-emergency escape time for crew and passengers is lengthened. These low heat-release materials have a variety of advantages and applications: interiors for ground-based facilities, interiors of space vehicles, and many commercial fire-protection environments. A microscale combustion calorimeter at the Federal Aviation Administration's (FAA) Technical Center tested NASA Langley Research Center materials samples. The calorimeter is shown. A sharp, quantitative, and reproducible heat-release-rate peak is obtained in the microscale heat-release-rate test. The newly tested NASA materials significantly reduced the heat release capacity and total heat release. The thermal stability and flammability behavior of the samples was very good. The new materials demonstrated a factor of 4 reduction in total heat release over ULTEM (a currently used material). This information is provided in the following barchart. In other tests, the materials showed greater than a factor 9 reduction in heat-release capacity over ULTEM. The newly tested materials were developed for low dielectric constant, low color, and good solubility. A scale up of the material samples is needed to determine the repeatability of the performance in larger samples. Larger panels composed of the best candidate materials will be tested in a larger scale FAA Technical Center fire facility. The NASA Glenn Research Center, Langley (Jeff Hinkley), and the FAA Technical Center (Richard Lyon) cooperatively tested these materials for the Accident Mitigation aspects of Fire Prevention under NASA's Aviation Safety Program.

Author

Polymers; Composite Materials; Flight Safety

20050196743 General Accounting Office, Washington, DC, USA

National Airspace System: FAA Has Made Progress but Continues to Face Challenges in Acquiring Major Air Traffic Control Systems

Jun. 2005; 96 pp.; In English

Report No.(s): PB2005-109024; GAO-05-331; No Copyright; Avail: CASI; A05, Hardcopy

The Federal Aviation Administrations (FAA) multibillion-dollar effort to modernize the nations air traffic control (ATC) system has suffered from cost, schedule, and/or performance shortfalls in its system acquisitions for more than two decades and has been on our list of high risk programs since 1995. FAAs performance-based Air Traffic Organization (ATO) was created in February 2004, in part, to address these legacy challenges. In this report, GAO examined (1) FAAs experience in meeting cost, schedule, and performance targets for major ATC system acquisitions; (2) steps taken to address legacy problems with the program and additional steps needed; and (3) the potential impact of the constrained federal budget on this program.

NTIS

Air Traffic Control; Airspace

20050198878 NASA Langley Research Center, Hampton, VA, USA

NASA's Research in Aircraft Vulnerability Mitigation

Allen, Cheryl L.; [2005]; 11 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA

Contract(s)/Grant(s): 23-076-10-CA

Report No.(s): AIAA Paper 2005-2385; No Copyright; Avail: CASI; A03, Hardcopy

Since its inception in 1958, the National Aeronautics and Space Administration s (NASA) role in civil aeronautics has been to develop high-risk, high-payoff technologies to meet critical national aviation challenges. Following the events of Sept. 11, 2001, NASA recognized that it now shared the responsibility for improving homeland security. The NASA Strategic Plan was modified to include requirements to enable a more secure air transportation system by investing in technologies and collaborating with other agencies, industry, and academia. NASA is conducting research to develop and advance innovative and commercially viable technologies that will reduce the vulnerability of aircraft to threats or hostile actions, and identify and inform users of potential vulnerabilities in a timely manner. Presented in this paper are research plans and preliminary status for mitigating the effects of damage due to direct attacks on civil transport aircraft. The NASA approach to mitigation includes: preventing loss of an aircraft due to a hit from man-portable air defense systems; developing fuel system technologies that prevent or minimize in-flight vulnerability to small arms or other projectiles; providing protection from

electromagnetic energy attacks by detecting directed energy threats to aircraft and on/off-board systems; and minimizing the damage due to high-energy attacks (explosions and fire) by developing advanced lightweight, damage-resistant composites and structural concepts. An approach to preventing aircraft from being used as weapons of mass destruction will also be discussed.
Author
Security; Air Transportation; Civil Aviation; NASA Programs; Aircraft Safety

20050198957 NASA Langley Research Center, Hampton, VA, USA
Fractographic Examination of the Vertical Stabilizer and Rudder from American Airlines Flight 587
Fox, Matthew R.; Schultheisz, Carl R.; Reeder, James R.; [2005]; 12 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-762-55-TA
Report No.(s): AIAA Paper 2005-2252; No Copyright; Avail: CASI; A03, Hardcopy

The first major structural component failure of a composite part on a commercial airplane occurred during the crash of American Airlines Flight 587. The fractured composite lugs that attached the vertical stabilizer to the aircraft tail and the fractured composite honeycomb rudder were examined as part of the National Transportation Safety Board investigation of the accident. In this paper the composite fractures are described and the resulting clues to the failure events are discussed.
Author
Component Reliability; Rudders; Structural Failure; Aircraft Accidents; Flight Safety; Fractures (Materials); Lugs

20050199068 NASA Langley Research Center, Hampton, VA, USA
NASA Structural Analysis Report on the American Airlines Flight 587 Accident - Local Analysis of the Right Rear Lug
Raju, Ivatury S; Glaessgen, Edward H.; Mason, Brian H; Krishnamurthy, Thiagarajan; Davila, Carlos G; January 2005; 21 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA
Contract(s)/Grant(s): 23-762-10-13
Report No.(s): AIAA Paper 2005-2255; No Copyright; Avail: CASI; A03, Hardcopy

A detailed finite element analysis of the right rear lug of the American Airlines Flight 587 - Airbus A300-600R was performed as part of the National Transportation Safety Board s failure investigation of the accident that occurred on November 12, 2001. The loads experienced by the right rear lug are evaluated using global models of the vertical tail, local models near the right rear lug, and a global-local analysis procedure. The right rear lug was analyzed using two modeling approaches. In the first approach, solid-shell type modeling is used, and in the second approach, layered-shell type modeling is used. The solid-shell and the layered-shell modeling approaches were used in progressive failure analyses (PFA) to determine the load, mode, and location of failure in the right rear lug under loading representative of an Airbus certification test conducted in 1985 (the 1985-certification test). Both analyses were in excellent agreement with each other on the predicted failure loads, failure mode, and location of failure. The solid-shell type modeling was then used to analyze both a subcomponent test conducted by Airbus in 2003 (the 2003-subcomponent test) and the accident condition. Excellent agreement was observed between the analyses and the observed failures in both cases. From the analyses conducted and presented in this paper, the following conclusions were drawn. The moment, Mx (moment about the fuselage longitudinal axis), has significant effect on the failure load of the lugs. Higher absolute values of Mx give lower failure loads. The predicted load, mode, and location of the failure of the 1985-certification test, 2003-subcomponent test, and the accident condition are in very good agreement. This agreement suggests that the 1985-certification and 2003- subcomponent tests represent the accident condition accurately. The failure mode of the right rear lug for the 1985-certification test, 2003-subcomponent test, and the accident load case is identified as a cleavage-type failure. For the accident case, the predicted failure load for the right rear lug from the PFA is greater than 1.98 times the limit load of the lugs. I.
Author
Accident Investigation; Aircraft Accidents; Finite Element Method; Failure Analysis; Safety Management; Structural Analysis

20050199435 NASA Glenn Research Center, Cleveland, OH, USA
Aeronautical-Satellite-Assisted Process Being Developed for Information Exchange Through Network Technologies (Aero-SAPIENT)
Zernic, Michael J.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Communications technologies are being developed to address safety issues during aviation travel. Some of these technologies enable the aircraft to be in constant bidirectional communications with necessary systems, people, and other aircraft that are not currently in place today. Networking technologies, wireless datalinks, and advanced avionics techniques are areas of particular importance that the NASA Glenn Research Center has contributed. Glenn, in conjunction with the NASA Ames Research Center, NASA Dryden Flight Research Center, and NASA Langley Research Center, is investigating methods and applications that would utilize these communications technologies. In mid-June 2000, the flight readiness of the network and communications technologies were demonstrated via a simulated aircraft. A van simulating an aircraft was equipped with advanced phased-array antennas (Advanced Communications/Air Traffic Management (AC/ATM) Advanced Air Transportation Technologies (AATT) project) that used commercial Ku-band satellite communications to connect Glenn, Dryden, and Ames in a combined system ground test. This test simulated air-ground bidirectional transport of real-time digital audio, text, and video data via a hybrid network configuration that demonstrated the flight readiness of the network and communications technologies. Specifically, a Controller Pilot Data Link Communications application was used with other applications to demonstrate a multiprotocol capability via Internet-protocol encapsulated ATN (Aeronautical Telecommunications Network) data packets. The significance of this combined ground test is its contribution to the Aero Information Technology Base Program Level I milestone (Software Technology investment area) of a real-time data link for the National Airspace System. The objective of this milestone was to address multiprotocol technology applicable for real-time data links between aircraft, a satellite, and the ground as well as the ability to distribute flight data with multilevel priorities among several sites.
Author
Aeronautical Satellites; Satellite Communication; Telecommunication; Information Systems; Radio Communication

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation, 17 Space Communications, Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar*.

20050198879 NASA Langley Research Center, Hampton, VA, USA
Augmentation of Cognition and Perception Through Advanced Synthetic Vision Technology
Prinzel, Lawrence J., III; Kramer, Lynda J.; Bailey, Randall E.; Arthur, Jarvis J.; Williams, Steve P.; McNabb, Jennifer; [2005]; 10 pp.; In English; 1st International Conference on Augmented Cognition, 22-27 Jul. 2005, Las Vegas, NV, USA
Contract(s)/Grant(s): 23-137-10-10; No Copyright; Avail: CASI; A02, Hardcopy

Synthetic Vision System technology augments reality and creates a virtual visual meteorological condition that extends a pilot's cognitive and perceptual capabilities during flight operations when outside visibility is restricted. The paper describes the NASA Synthetic Vision System for commercial aviation with an emphasis on how the technology achieves Augmented Cognition objectives.
Author
Cognition; Enhanced Vision; Visual Perception; Navigation Aids; Air Navigation

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information see also *18 Spacecraft Design, Testing and Performance*; and *39 Structural Mechanics*. For land transportation vehicles see *85 Technology Utilization and Surface Transportation*.

20050188574 SRI International Corp., Menlo Park, CA USA
Integrating Mission, Robot Localization and Communication Requirements Through Collaboration
Ortiz, Charles L.; May 2005; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-C-0264
Report No.(s): AD-A434157; No Copyright; Avail: Defense Technical Information Center (DTIC)

To develop a de-centralized system for allocating mobile sensor assets controlled by teams of autonomous air vehicle (AVs) and deployed in spatially complex urban environments. The sensor assets are to support AV missions involving the pursuit of one or more mobile intelligent ground adversaries. Since sensor information is typically uncertain and incomplete,

AVs must be able to cooperate to coordinate sensor assignments in the most efficient way possible. The environments in which such teams are deployed are spatially complex, introducing additional uncertainty arising from perceptual occlusions and the like. In addition to target tracking, we also plan to develop distributed algorithms for dynamically clustering vehicles around objects of interest (e.g. to protect a convoy). Existing approaches to coordinating the activities of AVs have focused on essentially 2D environments.
DTIC
Air Navigation; Cities; Drone Vehicles; Position (Location); Robots

20050188625 Purdue Univ., West Lafayette, IN USA
Laminar Boundary-Layer Instabilities on Hypersonic Cones: Computations for Benchmark Experiments
Robarge, Tyler W.; Schneider, Steven P.; Jun. 2005; 19 pp.; In English
Report No.(s): AD-A434260; AIAA-2005-5024; No Copyright; Avail: CASI; A03, Hardcopy

Although significant advances have been made in hypersonic boundary-layer transition prediction in the last several decades, most design work still relies on empirical correlations or wind tunnel tests. Codes using the semi-empirical eN method will need to be verified and validated before being used for expensive flight vehicles. The STABL code package and its PSE-Chem stability solver are used to compute first and second mode instabilities for both sharp and blunt cones at wind tunnel conditions, with laminar mean flows provided by the DPLR2D Navier-Stokes code. Stetson's 3.81 mm blunt cone case, a sharp cone at Mach 3.5, and a very blunt cone at Mach 8 are analyzed. The computed transition locations agree well with previous computations by other researchers, but larger differences are seen in the local amplification rates for the Stetson blunt cone case. the applicability of various transport property models and their effect on boundary layer stability are examined. This work helps to extend the applicability of STABL to low-temperature flows.
DTIC
Coding; Hypersonic Flight; Hypersonics; Laminar Boundary Layer; Nose Cones; Stability

20050188648 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Full Capability Formation Flight Control
Osteroos, Ryan K.; Feb. 2005; 204 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434288; AFIT/GAE/ENY/05-M16; No Copyright; Avail: CASI; A10, Hardcopy

The subject of automatic formation flight control is of current interest to the development of Unmanned Aerial Vehicles (UAV). Previous control approaches have been refined in this work to allow more robust maneuvering and to include a fourth control parameter. The equations of motion for each aircraft as a point mass, expressed in a wind-axis coordinate system, are coupled into differential equations that model the two aircraft system dynamics. Control laws are developed that include proportional and integral action. Gains are determined based on formation performance. Lead maneuvers are simulated and the controller is gauged on its ability to maintain the commanded formations in and out of the vortex wake generated by the lead aircraft. A Dryden wind model at varying intensities is applied to the system. In simulation the controller maintained acceptable performance in all maneuvers tested. A slightly modified controller was applied to a USAF NF-16D aircraft for flight testing. Utilizing a data link system and a virtual lead aircraft generated from a ground based control station, the NF-16D was able to flight test the controller. In-flight, the controller was stable, and able to perform all of the desired formation hold and change maneuvers.
DTIC
Drone Vehicles; Flight Control

20050188698 Military Academy, West Point, NY USA
A Data Warehouse to Support Condition Based Maintenance (CBM)
Henderson, Steven J.; Kwinn, Michael J., Jr; May 2005; 373 pp.; In English
Contract(s)/Grant(s): Proj-DSE-R-0509
Report No.(s): AD-A434357; USMA-DSE-TR-0509; DSE-R-0530; No Copyright; Avail: CASI; A16, Hardcopy

The USA Army's legacy maintenance strategy for its helicopter fleet is centered on replacing and repairing components based on aircraft hours flown. This strategy overlooks how variations in environmental conditions, component stresses, and other exogenous factors effect the lifetime of specific components across the entire fleet of Army Aviation Aircraft. This report describes the design and implementation of a data warehouse that subsumes many disparate databases currently housing information about these factors. This data warehouse supports a common synchronized 'maintenance picture' that includes state, health, usage, and logistics data for any component on any helicopter in the fleet. This view enables researchers and

planners to individually manage component maintenance according to a 'condition based' policy. This report discusses a systems engineering approach to creating a data warehouse including logical and physical designs, data management strategies, and an implementation plan. Discussion is also included detailing how the warehouse might be adopted for condition-based maintenance of all Army systems.
DTIC
Data Bases; Data Management; Maintenance

20050188736 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Experimentation and Analysis of Composite Scarf Joint
Cook, Benjamin M.; Mar. 2005; 215 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434441; AFIT/GA/ENY/05-M03; No Copyright; Avail: Defense Technical Information Center (DTIC)

Composite bonded scarf repairs were examined by experimentally measuring and analytically predicting the residual curing strains and strains due to mechanical loading. To accomplish this a three prong approach was used: a full strain field through a repaired laminate's thickness was measured for both a loaded specimen and a specimen with the residual strain released, models were developed for comparison to both states, and data was collected for large tensile test specimens at various stages of being scarf repaired. A ^14:1 straight scarfed one-inch wide specimen was used to collect Moire interferometry data to calculate a full strain field due to mechanical loading and strain release. A three-dimensional thermo mechanical linear elastic analysis using an Air Force Research Laboratory in-house stress analysis program B-Spline Analysis Method (BSAM) results were correlated to the Moire interferometry test results. Three large tensile test specimens were tested as manufactured, three were tested with a scarfed hole in the center, and the remaining were tested with a scarf repair centered on a hole in the center. The strain gage results from the panels are presented. An additional feature of this work was to document each of the difficulties present in the given methods incorporated in this research.
DTIC
Composite Materials; Interferometry; Residual Stress; Scarf Joints; Stress Analysis

20050188760 Army Research Inst. Field Unit, Fort Rucker, AL USA
Introduction to and Review of Simulator Sickness Research
Johnson, David M.; Apr. 2005; 70 pp.; In English
Contract(s)/Grant(s): Proj-A790
Report No.(s): AD-A434495; ARI-RR-1832; No Copyright; Avail: CASI; A04, Hardcopy

This report reviews, and explains the research literature pertaining to simulator sickness. Simulator sickness is a form of motion sickness. Consequently, motion sickness is reviewed also. Special emphasis is given to simulator-based flight training--especially helicopter flight training. This review includes the sensory basis of the perception of motion, the terminology of motion sickness and simulator sickness, a selected history of these research fields, sickness signs and symptoms, measurement issues, incidence of sickness, residual aftereffects, adaptation to a novel motion environment, susceptibility factors, performance issues, training issues, safety issues, treatment, theory, guidelines for simulator-based flight training, and suggestions for further research. The sensory conflict theory and the postural instability theory are described insofar as they relate both to motion sickness and to simulator sickness. The effect of simulator sickness on training effectiveness, if any, remains a subject for future applied research
DTIC
Flight Simulators; Flight Training; Helicopters; Motion Sickness

20050188805 Integrated Smart Structures, Inc., Copley, OH USA
Rapid and Robust Dynamics-Based Nondestructive Method for Aerospace Structural Health Monitoring
Qiao, Pizhong; Lestari, Wahvu; Jun. 2005; 37 pp.; In English
Contract(s)/Grant(s): FA9550-04-C-0078
Report No.(s): AD-A434580; ISS00004-F; AFRL-SR-AR-TR-05-0228; No Copyright; Avail: CASI; A03, Hardcopy

Report developed under STTR contract for Topic F045-016-0125 addresses dynamic-based damage identification techniques for structural health monitoring (SHM) of aerospace structures. Two systems (i.e., the scanning laser vibrometer (SLV) and PVDF sensor) are used to acquire the dynamic information, and effective damage detection algorithms (e.g., the gapped smoothing method (GSM) and generalized fractal dimension (GFD) and schemes (e.g., the uniform load surface (ULS) and combined static/dynamic techniques) are developed to evaluate the damage. It is demonstrated that both the GSM and GFD methods are capable of identifying damage without baseline information of healthy structure. Application of the

static/dynamic approach improves the performance of the damage identification, and the ULS increases the effectiveness of the detection at low modes. In general, the PVDF sensor system is good for acquiring several low curvature mode shapes; while the SLV system can generate higher displacement modes. Utilizing the advantages of each measurement system, the proposed identification algorithms have great potential for viable SHM products, e.g., the PVDF sensor system for on-board and the SLV system for portable on-site monitoring. The proposed sensor systems and developed identification techniques pave the foundation for further refinement of the dynamics-based method, field implementation and commercial development.
DTIC
Damage; Detection; Health

20050188806 Michigan Univ., Ann Arbor, MI USA
Aeroelasticity, Aerothermoelasticity and Aeroelastic Scaling of Hypersonic Vehicles
Freidmann, Peretz P.; Powell, Kenneth G.; Dec. 2004; 21 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0158
Report No.(s): AD-A434581; AFRL-SR-AR-TR-05-0227; No Copyright; Avail: CASI; A03, Hardcopy

This final report describes the work during the period of the grant. Three separate hypersonic aeroelastic stability problems were considered: (a) a typical cross section having a double wedge airfoil, (b) the stability of a low aspect ratio wing, also with a double wedge airfoil, and (c) the behavior of a complete generic hypersonic vehicle. For problems (a) the unsteady airloads were computed using third order piston theory, as well a CFD based Euler and Navier-Stokes loads. For case (b) piston theory, Euler and Navier-Stokes based airloads were used, and case (c) both piston theory and Euler airloads were used. For the three-dimensional wing the treatment of thermal effect was also considered by solving the heat transfer problem using the Navier Stokes equations to determine the temperature distribution over the vehicle and conducting an aeroelastic analysis that accounts for the effect of thermal stresses and material degradation on the mode shapes. These mode shapes were used in an aeroelastic analysis based on 3rd order piston theory. This comprehensive treatment of the aerothermoelastic problem, the first of its kind in the literature, produces large reductions in aeroelastic stability margins. The results indicate that the flutter boundaries for third order piston theory can differ by 35% from those based on Euler unsteady loads. Solutions based on the loads obtained from the solution of the Navier-Stokes equation indicate further changes in aeroelastic stability margins. Important conclusions for the design of such vehicles are summarized in the body of the report.
DTIC
Aeroelasticity; Aerothermoelasticity; Computational Fluid Dynamics; Flutter; Heat Transfer; Hypersonic Vehicles; Hypersonics; Stability; Structural Analysis

20050192472 NASA Langley Research Center, Hampton, VA, USA
Flight Test Evaluation of Situation Awareness Benefits of Integrated Synthetic Vision System Technology f or Commercial Aircraft
Prinzel, Lawrence J., III; Kramer, Lynda J.; Arthur, Jarvis J., III; [2005]; 6 pp.; In English; 2005 (13th) International Symposium on Aviation Psychology, 18-21 Apr. 2005, Oklahoma City, OK, USA
Contract(s)/Grant(s): 23-079-60-20; No Copyright; Avail: CASI; A02, Hardcopy

Research was conducted onboard a Gulfstream G-V aircraft to evaluate integrated Synthetic Vision System concepts during flight tests over a 6-week period at the Wallops Flight Facility and Reno/Tahoe International Airport. The NASA Synthetic Vision System incorporates database integrity monitoring, runway incursion prevention alerting, surface maps, enhanced vision sensors, and advanced pathway guidance and synthetic terrain presentation. The paper details the goals and objectives of the flight test with a focus on the situation awareness benefits of integrating synthetic vision system enabling technologies for commercial aircraft.
Author
Flight Tests; Systems Integration; Enhanced Vision; Prevention

20050192626 Georgia Inst. of Tech., Atlanta, GA, USA
Noise Reduction Through Circulation Control
Munro, Scott E.; Ahuja, K. K.; Englar, Robert J.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 497-527; In English; 39th AIAA Aerospace Sciences Meeting and Exhibit, 1-8 Jan. 2001, USA; See also 20050192624; Original contains black and white illustrations
Contract(s)/Grant(s): NAG1-2146
Report No.(s): AIAA Paper 2001-0666; No Copyright; Avail: CASI; A03, Hardcopy

Circulation control technology uses tangential blowing around a rounded trailing edge or a leading edge to change the force and moment characteristics of an aerodynamic body. This technology has been applied to circular cylinders, wings, helicopter rotors, and even to automobiles for improved aerodynamic performance. Only limited research has been conducted on the acoustic of this technology. Since wing flaps contribute to the environmental noise of an aircraft, an alternate blown high lift system without complex mechanical flaps could prove beneficial in reducing the noise of an approaching aircraft. Thus, in this study, a direct comparison of the acoustic characteristics of high lift systems employing a circulation control wing configuration and a conventional wing flapped configuration has been made. These results indicate that acoustically, a circulation control wing high lift system could be considerably more acceptable than a wing with conventional mechanical flaps.
Author
Noise Reduction; Leading Edges; Flapping; Wing Flaps; Aerodynamic Configurations

20050192627 NASA Langley Research Center, Hampton, VA, USA
Experimental Development and Evaluation of Pneumatic Powered-Lift Super-STOL Aircraft
Englar, Robert J.; Campbell, Bryan A.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 101-139; In English; See also 20050192624; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The powered-lift Channel Wing concept has been combined with pneumatic Circulation Control aerodynamic and propulsive technology to generate a Pneumatic Channel Wing (PCW) configuration intended to have Super-STOL or VSTOL capability while eliminating many of the operational problem areas of the original Channel Wing vehicle. Wind-tunnel development and evaluations of a PCW powered model conducted at Georgia Tech Research Institute (GTRI) have shown substantial lift capabilities for the blown configuration (CL values of 10 to 11). Variation in blowing of the channel was shown to be more efficient than variation in propeller thrust in terms of lift generation. Also revealed was the ability to operate unstalled at very high angles of attack of 40 deg - 45 deg, or to achieve very high lift at much lower angle of attack to increase visibility and controllability. In order to provide greater flexibility in Super-STOL takeoffs and landings, the blown model also displayed the ability to interchange thrust and drag by varying blowing without any moving parts. A preliminary design study of this pneumatic vehicle based on the two technologies integrated into a simple Pneumatic Channel Wing configuration showed very strong Super-STOL potential. This paper presents these experimental results, discusses variations in the configuration geometry under development, and addresses additional considerations to extend this integrated technology to advanced design studies of PCW-type vehicles.
Author
Short Takeoff Aircraft; Models; Aerodynamic Configurations; Aerodynamic Drag; Channel Wings

20050192632 NASA Langley Research Center, Hampton, VA, USA
Experimental Investigation of a Morphing Nacelle Ducted Fan
Kondor, Shayne A.; Moore, Mark; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 435-468; In English; See also 20050192624; Original contains color illustrations
Contract(s)/Grant(s): NAG1-02093; No Copyright; Avail: CASI; A03, Hardcopy

The application of Circulation Control to the nacelle of a shrouded fan is proposed as a means to enhance off-design performance of the shrouded fan. Typically, a fixed geometry shroud is efficient at a single operating condition. Modifying circulation about the fixed geometry is proposed as a means to virtually morph the shroud without moving surfaces. This approach will enhance off-design-point performance with minimal complexity, weight, and cost. Termed the Morphing Nacelle, this concept provides an attractive propulsion option for Vertical Take-off and Landing (VTOL) aircraft, such conceptual Personal Air Vehicle (PAV) configurations proposed by NASA. An experimental proof of concept investigation of the Morphing Nacelle is detailed in this paper. A powered model shrouded fan model was constructed with Circulation Control (CC) devices integrated in the inlet and exit of the nacelle. Both CC devices consisted of an annular jet slot directing a jet sheet tangent to a curved surface, generally described as a Coanda surface. The model shroud was tailored for axial flight, with a diffusing inlet, but was operated off-design condition as a static lifting fan. Thrust stand experiments were conducted to determine if the CC devices could effectively improve off-design performance of the shrouded fan. Additional tests were conducted to explore the effectiveness of the CC devices a means to reduce peak static pressure on the ground below a lifting fan. Experimental results showed that off-design static thrust performance of the model was improved when the CC devices were employed under certain conditions. The exhaust CC device alone, while effective in diffusing the fan exhaust and improving weight flow into shroud inlet, tended to diminish performance of the fan with increased CC jet momentum. The inlet CC device was effective at reattaching a normally stalled inlet flow condition, proving an effective means of enhancing

performance. A more dramatic improvement in static thrust was obtained when the inlet and exit CC devices were operated in unison, but only over a limited range of CC jet momentum. Operating the nacelle inlet and exit CC devices together proved very effective in reducing peak ground plane static pressure, while maintaining static thrust. The Morphing Nacelle concept proved effective at enhancing off-design performance of the model; however, additional investigation is necessary to generalize the results.
Author
Experimentation; Ducted Fans; Control Equipment; Circulation Control Rotors; Nacelles

20050192634 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
Numerical Analysis of Circulation Control on a NCCR 1510-7607N Airfoil using RANS Models
Viswanathan, Aroon K.; Tafti, Danesh K.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 197-226; In English; See also 20050192624; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Numerical predictions of the lift augmentation and circulation control have been presented for a NCCR 1510-7607N airfoil using Reynolds-Averaged Navier Stokes (RANS) equations. Computations have been carried out for an airfoil at 0 angle-of-attack with the Reynolds number (based on chord length, c) of 5.45 x 10(exp 5). The effects of trailing edge wall jets have been studied and two different blowing rates have been simulated to show the effect of the jet momentum on the lift characteristics. Computations have been carried out for a fixed slot height (h/c = 0.003). Numerical solutions obtained using kappa-omega RANS model are compared with experimental results. The results show very good agreement of the pressure and the lift coefficients with the experimental values, at the low blowing rate case, while showing reasonable agreement at the high blowing ratio.
Author
Numerical Analysis; Circulation Control Airfoils; Aerodynamic Coefficients; Lift Augmentation; Navier-Stokes Equation

20050194604 National Oceanic and Atmospheric Administration, Washington, DC, USA
NOAA Light Aircraft Forum. Session Results, November 15-16, 2001
January 2001; 40 pp.; In English
Report No.(s): PB2005-107251; No Copyright; Avail: CASI; A03, Hardcopy

November 15-16, the Light Aircraft Workshop was focused on gathering the inputs of light aircraft users and service providers on: New light aircraft opportunities in NOAA. Desirable capabilities to which NOAA Line Offices would like access. Existing or future changes in technology and the impact on future requirements. Performance measures for OMAO. Expectations of OMAO. The workshop was structured to achieve maximum participation and input. Six tables with 5 participants each, representing a cross section of NOAA Line Offices and OMAO personnel, were challenged with the tasks to formulate responses and to offer top 5 priorities for each of the 5 topics.
NTIS
Light Aircraft; Meteorological Research Aircraft; Data Acquisition

20050194639 Forest Service, Missoula, MT, USA, Bureau of Land Management, Washington, DC, USA
Professional Helicopter Pilot Guide
Feb. 1996; 146 pp.; In English
Report No.(s): PB2005-107916; No Copyright; Avail: CASI; A07, Hardcopy

The Professional Helicopter Pilot Guide is organized into a topic format style. Each chapter provides a complete discussion of the topic. As such, there exists some duplicate discussion or description of material from chapter to chapter. This was done such that as a reference source, the reader can consult any given topic and receive all of the pertinent information, rather than be referred back and forth to other chapters for needed information to fully understand the topic in question. This document is an introduction to the arena of wildland firefighting, as it applies to the helicopter pilot. For the helicopter to be a fully effective tool in fire suppression it is essential that pilots work closely with the individuals involved in management and use of helicopters. These people are primarily the helicopter manager and the crew, but may include any member of the firefighting team. A helicopter is a valuable and efficient fire fighting resource available to the wildland fire service. To attain the highest efficiency, close cooperation must take place between the pilot and incident management personnel.
NTIS
Fire Fighting; Fires; Helicopters; Flight Safety; Human Performance

20050196043 Army Aeromedical Research Lab., Fort Rucker, AL USA

Self-Report and Ocular Measures of Fatigue in U.S. Army Apache Aviators Following Flight

LeDuc, Patricia A.; Greig, Joanna L.; Dumond, Shannen L.; May 2005; 16 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434859; USAARL-2005-10; No Copyright; Avail: CASI; A03, Hardcopy

AH-64 Apache helicopter pilots fly the aircraft using a monocular helmet-mounted display that provides imagery from two separate forward-looking infrared sensors mounted on the nose of the aircraft. Studies have documented complaints of fatigue, headaches, and visual problems associated with the use of this sighting system. The goal of this study were 1)to quantify possible flight-induced fatigue in Apache aviators and 2)to evaluate minimally intrusive neurophysiologic measures of fatigue for potential use in operational environments. Methods: Using a pre-post design, we assessed self-reported levels of alertness, physical, cognitive, and visual fatigue and ocular indices of fatigue obtained using an instrument specifically designed to capture various eye responses. Fifty-three aviators contributed data to this study. Results: Significant differences in all pre- and postflight ocular responses were observed. Pupil size and constriction latency increased while constriction amplitude and saccadic velocity decreased. Significant pre- and postflight differences also were seen on all self-report measures. Pilots reported less alert and more fatigued following flight. Conclusions: We found that flight in an AH-64 Apache was a significant factor in producing changes in ocular and self-report measures similar to those produced by sleep loss.
DTIC

Aircraft Pilots; Eye Movements; Flight

20050196061 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Controlling Sideslip Angle to Reduce the Radar Exposure of a Tactical, Rotary Winged UAV

Bulseco, Jonathan D.; Mar. 2005; 117 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434892; AFIT/GAE/ENY/05-M26; No Copyright; Avail: Defense Technical Information Center (DTIC)

This work investigates another way of contributing to the radar minimization solution for air vehicles in a threat environment. While much research has been conducted on structural solutions to radar exposure minimization, not much work has been done in the area of using control to continuously assess and present the smallest radar cross section of an air vehicle to oncoming threat radar systems by changing the aircraft's orientation. This work looks at the application of sideslip/beta angle feedback control of an unmanned helicopter to minimize radar cross section exposure in a hostile radar environment. A new way of controlling aircraft trajectory is introduced that incorporates both path and orientation optimization feedback; the aircraft's heading is controlled to orient the vehicle in a way that reduces its radar cross section, while sideslip angle is used to control the aircraft's path. A representative hostile environment is created and results show that a substantial reduction in radar cross section exposure can be achieved with beta feedback control. A linear state space model is derived for the OH-6A helicopter with the JANRAD software program. Eigenstructure assignment is used to shape the response of the helicopter into desired response modes. A Matlab based flight control system is developed around the derived helicopter model with altitude, heading, and beta angle command signals that drive four conventional helicopter control inputs.
DTIC

Exposure; Flight Control; Helicopters; Radar Cross Sections; Sideslip

20050196171 Air Force Systems Command, Brooks AFB, TX USA

US Military Unmanned Aerial Vehicle Mishaps: Assessment of the Role of Human Factors Using Human Factors Analysis and Classification System (HFACS)

Tvaryanas, Anthony P.; Thompson, William T.; Constable, Stefan H.; Mar. 2005; 37 pp.; In English

Report No.(s): AD-A435063; HSW-PE-BR-TR-2005-0001; XC-311TH HSW; No Copyright; Avail: CASI; A03, Hardcopy

Background: This study was a 10-year cross sectional analysis of human factors in U.S. military UAV mishaps. Methods: Class A-C UAV mishap reports were reviewed and human factors coded using the Human Factors Analysis and Classification System (HFACS). Binary logistic regression was used to create models predicting unsafe operator acts. Results: 133/221(60.2%) UAV mishaps were human related. Predictors of unsafe acts were technological environment and cognitive factors in the Air Force (P \h 0.010), organizational processes, psycho-behavioral factors, and crew resource management in the Army (P \h 0.001), and work and attention and risk management in the Navy (P \h 0.025). The frequency of specific types of unsafe acts differed between the services with skill-based errors more common in the Air Force (P = 0.001) and violations in the Army (P = 0.016). Conclusion: Recurring latent failures at the organizational, supervisory, and preconditions levels contributed to more than half of UAV mishaps. The patterns of latent failures and unsafe acts differed between the services.
DTIC

Accidents; Classifications; Human Factors Engineering; Pilotless Aircraft; Statistical Analysis

20050196203 Army Combined Arms Center, Fort Leavenworth, KS USA
Air Defense with an Attitude: Helicopter v. Helicopter Combat
Grau, Lester W.; Adams, James H., III; Feb. 2003; 11 pp.; In English
Report No.(s): AD-A435109; No Copyright; Avail: Defense Technical Information Center (DTIC)

Helicopters are proliferating among the world's armies. This growing inventory includes armed helicopters equipped with weapons systems suitable for engaging other helicopters in aerial combat. In a major regional conflict, armed helicopters might pose a threat that neither the U.S. Air Force nor U.S. Army is prepared to counter.
DTIC
Air Defense; Attack Aircraft; Combat; Helicopters; Military Helicopters; Warfare; Weapon Systems

20050196216 BAE Systems Advanced Information Technologies, Inc., Arlington, VA USA
Dynamic Control and Formal Models of Multi-Agent Interactions and Behaviors
Roszman, Larry; Armstrong, Derek; Khalali, Aram; Hickling, Gwen; May 2005; 51 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-C-0182; DARPA ORDER-K542; Proj-TASK
Report No.(s): AD-A435125; AFRL-IF-RS-TR-2005-188; No Copyright; Avail: Defense Technical Information Center (DTIC)

New Multi-Agent System (MAS) approaches to complex DoD problems hold the promise of previously unrealized levels of autonomy, adaptability, and flexibility of agent-controlled systems. These systems will provide essential capabilities in command and control, surveillance, automated targeting and weapons delivery, and biochem monitoring. BAE SYSTEMS Advanced Information Technologies' work focused on three areas. First was the development of the Open Experimentation Framework to facilitate research, evaluation, and characterization of the emerging science of Multi-Agent Systems. Second was the design and facilitation of a project-wide demonstration in which all Principal Investigators participate. Third was our theoretical research into cooperative and adaptive methods for multi-agent systems to service asynchronously appearing pop up tasks.
DTIC
Adaptation; Dynamic Control; Optimization

20050196219 Industrial Coll. of the Armed Forces, Washington, DC USA
Industry Study Paper: The Aircraft Industry, AY 2004, Seminar 2
Morris, Stephen H.; Archibald, Dominic; Berg, Gerry C.; McDermott, Edwin; Rehberg, Carl D.; Jan. 2004; 41 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435134; No Copyright; Avail: Defense Technical Information Center (DTIC)

The aircraft industry now appears to have weathered the 'perfect storm' of Severe Acute Respiratory Syndrome (SARS) and the Global War on Terrorism (GWOT), emerging somewhat battered but poised to begin a slow recovery in the coming years. Orders for new aircraft are up and thus revenues and profits should begin to climb in 2005, reversing declining trends since 2001. However, airlines remain under intense pressure to cut costs to remain profitable, forcing aircraft and engine manufacturers to adopt austere measures. Meanwhile, defense expenditures have received a boost from heightened security concerns and developing technologies such as unmanned air vehicles (UAVs) and unmanned combat air vehicles (UCAVs). The defense market also will continue to enjoy expansion as a result. The overall outlook for the aircraft industry now appears to indicate steady growth over the next decade and should provide sufficient demand for both Airbus' A380 and Boeing's 7E7, as well as the growing regional jet market, albeit in an atmosphere of intense competition. However, security remains a top concern, as another terrorist attack on or involving passenger aircraft would have devastating long-term effects on the entire industry. This report focuses on four sectors of the aircraft industry: commercial fixed wing; military fixed wing; rotor craft (helicopters and tilt rotor aircraft); and aircraft jet engines. Key players in the individual sectors will be highlighted in the respective sections of the report. Special focus segments have also been included on regional jets and UAVs.
DTIC
Airline Operations; Commercial Aircraft; Economics; Forecasting; Helicopters; Industries; Jet Engines

20050196250 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Modeling Information Quality Expectation in Unmanned Aerial Vehicle Swarm Sensor Databases
Baldwin, Patrick D.; Mar. 2005; 122 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435192; AFIT/GCS/ENG/05-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

Swarming Unmanned Aerial Vehicles (UAVs) are the future of Intelligence, Surveillance and Reconnaissance (ISR). Swarms of hundreds of these vehicles, each equipped with multiple sensors, will one day fill the skies over hostile areas. As the sensors collect hundreds of gigabytes of data, telemetry data links will be unable to transmit the complete data picture to the ground in real time. The collected data will be stored on board the UAVs and selectively downloaded through queries issued from analysts on the ground. Analysts expect to find relevant sensor data within the collection of acquired sensor data. This expectation is not a quantified value, rather a confidence that this relevant data exists. An expectation of the likely quality of the available sensor information is determined by the user through the use of the methods and tools developed in this thesis. This work develops swarm coverage analysis models using position in time data from the swarm. With these models, a geometric analysis of the swarm is conducted that shows analysts when and where the swarm likely collected sensor data most relevant to a need. Convex hulls are used to calculate areas of coverage as well as swarm and sensor densities. Target profiling algorithms are developed that show target coverage over time from the swarm for each sensor type. Target-centric and sensor-centric analyses allow analysts to quickly determine where individual swarm agents were relative to a target at any point during the mission. Finally a series of visualizations of the swarm and targets are created that allow the analyst to view swarm activity from the perspective of individual swarm members or targets.
DTIC
Data Bases; Expectation; Information Theory; Pilotless Aircraft; Reconnaissance

20050196283 Naval Postgraduate School, Monterey, CA USA
The Raven Small Unmanned Aerial Vehicle (SUAV), Investigating Potential Dichotomies Between Doctrine and Practice
Jenkins, Glenn E.; Snodgrass, William J., Jr; Jun. 2005; 75 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435397; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goal of this MBA Project is to investigate possible disconnects between doctrine and practice in the employment of the Raven Small Unmanned Aerial Vehicle (SUAV). The Army's current Small UAV requirements are based upon the Future Combat System's Operations Requirements Document and has not been validated at the platoon or company level. The Raven SUAV is a Commercial off the Shelf (COTS) item that swiftly became the Army's Small UAV of choice for operations in Afghanistan and Iraq. Doctrine and Techniques. Tactics. and Procedures (TTP) have been written for the Raven SUAV; however, it is not standard practice for all units operating the system abroad. The last review of the SUAV operational requirements was conducted in 2003 but did not specifically address its usage on the battlefield. In an attempt to fill that gap, this project focuses on real-world usage of the Raven SUAV system. We compare doctrine versus practice using the Department of Defense's (DoD) Doctrine, Organization, Training, Material. Leadership, Personnel, Facilities (DOTML-PF) model as the primary logic construct. The report begins by providing a background of the Raven SUAV. to include its evolution from a COTS item to the Army's SUAV of choice, and how it has impacted the warfighter. Next, the authors provide an overview of DOTML-PF in order to provide a basis for comparing doctrine and practice. The study then looks in-depth at doctrine and practice using DOTML-PF as the model for revealing differences between the two. Finally, the authors analyze these differences and recommend solutions to mitigate shortfalls in actual Raven SUAV usage on the battlefield.
DTIC
Aircraft; Commercial Off-the-Shelf Products; Dichotomies; Pilotless Aircraft

20050196547 Stavatti Military Aerospace, Saint Paul, MN USA
A Business Overview & Summary of the SM-27S/T MACHETE RDT&E Program as Undertaken by the Military Aerospace/Tactical Air Warfare Systems Division of STAVATTI
Beskar, Christopher R.; Jun. 2005; 79 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435236; SD-87700-WS; No Copyright; Avail: Defense Technical Information Center (DTIC)

The SM-27 MACHETE is a next generation, COunter INsurgency (COIN), Light Attack (LA) and Advanced Trainer (AT) aircraft developed by STAVATTI as a privately financed, corporate initiative to replace OV-10 BRONCO, A-37 DRAGONFLY and OA-10A platforms in the COIN/FAC role. Marketed as a product for DCS, the SM-27 will be available for export to qualified NATO allies with IOC prior to 2009. This document provides a summary of the RDT&E program associated with the SM-27S/T turboprop variant of the MACHETE family, focusing upon principal aspects of system development including a platform, market, competition and engineering/prototype fabrication and flight test/qualification overview as undertaken by the Tactical Air Warfare Systems Division of STAVATTI MILITARY AEROSPACE.
DTIC
Aerospace Systems; Aircraft Configurations; Commerce; Fighter Aircraft; Fixed Wings; Warfare

20050196563 NASA Glenn Research Center, Cleveland, OH, USA

Feasibility of Actively Cooled Silicon Nitride Airfoil for Turbine Applications Demonstrated

Bhatt, Ramakrishna T.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Nickel-base superalloys currently limit gas turbine engine performance. Active cooling has extended the temperature range of service of nickel-base superalloys in current gas turbine engines, but the margin for further improvement appears modest. Therefore, significant advancements in materials technology are needed to raise turbine inlet temperatures above 2400 F to increase engine specific thrust and operating efficiency. Because of their low density and high-temperature strength and thermal conductivity, in situ toughened silicon nitride ceramics have received a great deal of attention for cooled structures. However, the high processing costs and low impact resistance of silicon nitride ceramics have proven to be major obstacles for widespread applications. Advanced rapid prototyping technology in combination with conventional gel casting and sintering can reduce high processing costs and may offer an affordable manufacturing approach. Researchers at the NASA Glenn Research Center, in cooperation with a local university and an aerospace company, are developing actively cooled and functionally graded ceramic structures. The objective of this program is to develop cost-effective manufacturing technology and experimental and analytical capabilities for environmentally stable, aerodynamically efficient, foreign-object-damage-resistant, in situ toughened silicon nitride turbine nozzle vanes, and to test these vanes under simulated engine conditions. Starting with computer aided design (CAD) files of an airfoil and a flat plate with internal cooling passages, the permanent and removable mold components for gel casting ceramic slips were made by stereolithography and Sanders machines, respectively. The gel-cast part was dried and sintered to final shape. Several in situ toughened silicon nitride generic airfoils with internal cooling passages have been fabricated. The uncoated and thermal barrier coated airfoils and flat plates were burner rig tested for 30 min without and with air cooling. Without cooling, the surface temperature of the flat plate reached approximately 2350 F. Starting with computer aided design (CAD) files of an airfoil and a flat plate with internal cooling passages, the permanent and removable mold components for gel casting ceramic slips were made by stereolithography and Sanders machines, respectively. The gel-cast part was dried and sintered to final shape. Several in situ toughened silicon nitride generic airfoils with internal cooling passages have been fabricated. The uncoated and thermal barrier coated airfoils and flat plates were burner rig tested for 30 min without and with air cooling. Without cooling, the surface temperature of the flat plate reached approximately 2350 F. With cooling, the surface temperature decreased to approximately 1910 F--a drop of approximately 440 F. This preliminary study demonstrates that a near-net-shape silicon nitride airfoil can be fabricated and that silicon nitride can sustain severe thermal shock and the thermal gradients induced by cooling and, thus, is a viable candidate for cooled components.

Author

Airfoils; Fabrication; Gas Turbine Engines; Silicon Nitrides; Feasibility Analysis

20050196628 NASA Langley Research Center, Hampton, VA, USA

Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2

Jones, Gregory S., Editor; Joslin, Ronald D., Editor; June 2005; 520 pp.; In English; 2004 NASA/ONR Circulation Control Workshop, 16-17 Mar. 2004, Hampton, VA, USA; See also 20050196629 - 20050196646

Contract(s)/Grant(s): WU 23-762-55-ME

Report No.(s): NASA/CP-2005-213509/PT2; L-18395B/PT2; No Copyright; Avail: CASI; A22, Hardcopy

This conference proceeding is comprised of papers that were presented at the NASA/ONR Circulation Control Workshop held 16-17 March 2004 at the Radisson-Hampton in Hampton, VA. Over two full days, 30 papers and 4 posters were presented with 110 scientists and engineers in attendance, representing 3 countries. As technological advances influence the efficiency and effectiveness of aerodynamic and hydrodynamic applications, designs, and operations, this workshop was intended to address the technologies, systems, challenges and successes specific to Coanda driven circulation control in aerodynamics and hydrodynamics. A major goal of this workshop was to determine the state-of-the-art in circulation control and to assess the future directions and applications for circulation control. The 2004 workshop addressed applications, experiments, computations, and theories related to circulation control, emphasizing fundamental physics, systems analysis, and applied research. The workshop consisted of single session oral presentations, posters, and written papers that are documented in this unclassified conference proceeding. The format of this written proceeding follows the agenda of the workshop. Each paper is followed with the presentation given at the workshop. the editors compiled brief summaries for each effort that is at the end of this proceeding. These summaries include the paper, oral presentation, and questions or comments that occurred during the workshop. The 2004 Circulation Control Workshop focused on applications including Naval vehicles (Surface and Underwater vehicles), Fixed Wing Aviation (general aviation, commercial, cargo, and business aircraft); V/STOL platforms (helicopters, military aircraft, tilt rotors); propulsion systems (propellers, jet engines, gas turbines), and ground vehicles (automotive,

trucks, and other); wind turbines, and other nontraditional applications (e.g., vacuum cleaner, ceiling fan). As part of the CFD focus area of the 2004 CC Workshop, CFD practitioners were invited to compute a two-dimensional benchmark problem for which geometry, flow conditions, grids, and experimental data were available before the workshop. The purpose was to accumulate a database of simulations for a single problem using a range of CFD codes, turbulence models, and grid strategies so as to expand knowledge of model performance/requirements and guide simulation of practical CC configurations.
Derived from text
Computational Fluid Dynamics; Data Bases; Jet Engines; Propulsion System Configurations; Systems Analysis; V/STOL Aircraft

20050196630 AdvanTek International, LLC, Boothwyn, PA, USA
Low-Cost, High-Quality Wind Tunnel Testing of a 30 Percent Elliptical Circulation Control Airfoil at Low Blowing Levels for Application to Wind Turbines
Kelso, Frederick J.; Laubsch, Kenneth L.; Haraldsson, Rikard K.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 911-919; In English; See also 20050196628; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

Contents include the following: Motivation for wind tunnel testing. Expert team. Test matrix. Design, fabrication and instrumentation. Test results. Conclusion. Path forward.
CASI
Wind Tunnel Tests; Circulation Control Airfoils; Design Analysis; Matrix Methods

20050196631 West Virginia Univ., Morgantown, WV, USA
Why Have Only Two Circulation-Controlled STOL Aircraft Been Built And Flown In Years 1974 - 2004
Loth, John L.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 603 - 640; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Circulation Control (CC) by Coanda blowing over a rounded trailing edge is by far the most blowing power efficient method for high lift generation. Only two CC aircraft have ever been build and flight-tested in the past 30 years. Why was one of the questions posed at the end of the 2004 ONR-NASA Circulation Control Workshop. Other high lift systems, such as the jet flap, upper surface blowing, augmenter wing and flap type thrust deflectors have found many applications on STOL aircraft. The two Circulation Control aircraft were the WVU CC Technology Demonstrator STOL flight-tested in 1974 and the Grumman A-6A flight-tested in 1979. This paper aims to provide some answers to that question. The design and construction of the WVU CC Technology Demonstrator STOL aircraft was completed in the period from 1971 to 1973. Starting on April 10, 1974, professional test pilot Shawn Roberts started 25 hours of flight-testing.
Author
Upper Surface Blowing; Short Takeoff Aircraft; Trailing Edges; Wing Flaps; Circulation Control Airfoils; Coanda Effect

20050196632 Textron Bell Helicopter, USA
From Concept to Production of the Coanda Driven Exhaust Deflector for the V-22
Wood, T.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 771-789; In English; See also 20050196628; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: Introduction. Need. Concept. Trade study. Ground testing. Production.
CASI
V-22 Aircraft; Coanda Effect; Ground Tests

20050196633 NASA Langley Research Center, Hampton, VA, USA
Pneumatic Flap Performance for a 2D Circulation Control Airfoil, Steady and Pulsed
Jones, Gregory S.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 845-888; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Circulation Control technologies have been around for 65 years, and have been successfully demonstrated in laboratories and flight vehicles alike, yet there are few production aircraft flying today that implement these advances. Circulation Control techniques may have been overlooked due to perceived unfavorable trade offs of mass flow, pitching moment, cruise drag, noise, etc. Improvements in certain aspects of Circulation Control technology are the focus of this paper. This report will

describe airfoil and blown high lift concepts that also address cruise drag reduction and reductions in mass flow through the use of pulsed pneumatic blowing on a Coanda surface. Pulsed concepts demonstrate significant reductions in mass flow requirements cor Circulation Control, as well as cruise drag concepts that equal or exceed conventional airfoil systems.
Author
Circulation Control Airfoils; Coanda Effect; Control Systems Design; Drag Reduction; Pneumatics; Blowing

20050196635 Novatek, Inc., USA
Design and Fabrication of Circulation Control Test Articles
Burdges, Kenneth P.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 723-741; In English; See also 20050196628; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This paper is an overview of a decade of experience in Computer Aided Design (CAD) and Computer Aided Machining (CAM) of test articles for wind tunnel and road testing of Circulation Control (CC) vehicles. Internal flow design features, such as sub-plenums and instrumentation are discussed. Techniques for slot adjustment mechanisms are described as well as difficulties in machining thin edges for blowing slots. Test articles include low speed and transonic wind tunnel models, racecar models and wings. Application of CC for drag reduction of heavy trucks and sport utility vehicles is included to illustrate some current design problems.
Author
Design Analysis; Fabrication; Computer Aided Design; Wind Tunnel Tests; Drag Reduction

20050196637 NASA Langley Research Center, Hampton, VA, USA
Wake Vortex Wingtip-Turbine Powered Circulation Control High-Lift System
Moore, Mark D.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 641-674; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

NASA s Vehicle Systems Program is investing in aeronautics technology development across six vehicle sectors, in order to improve future air travel. These vehicle sectors include subsonic commercial transports, supersonic vehicles, Uninhabited Aerial Vehicles (UAVs), Extreme Short Takeoff and Landing (ESTOL) vehicles, Rotorcraft, and Personal Air Vehicles (PAVs). While the subsonic transport is firmly established in U.S. markets, the other vehicle sectors have not developed a sufficient technology or regulatory state to permit widespread, practical use. The PAV sector has legacy products in the General Aviation (GA) market, but currently only accounts for negligible revenue miles, sales, or market share of personal travel. In order for PAV s to ever capture a significant market, these small aircraft require technologies that permit them to be less costly, environmentally acceptable, safer, easier to operate, more efficient, and less dependent on large support infrastructures.
Author
Vortices; Wakes; Powered Lift Aircraft; Rotary Wing Aircraft; Turbines

20050196638 Complere, Inc., Pacific Grove, CA, USA
Measurement and Analysis of Circulation Control Airfoils
Owen, F. Kevin; Owen, Andrew K.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 947-955; In English; See also 20050196628; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

A wind tunnel investigation has been conducted of a two-dimensional circulation control airfoil section equipped with trailing edge blowing. The tests were conducted in the NASA-Ames 2 x 2-Ft. Variable Density Transonic Wind Tunnel over a range of freestream Mach number and unit Reynolds numbers. Detailed non-intrusive flow-field measurements of the mean flow and turbulent properties were obtained in the airfoil wake for a number of different blowing coefficients. These results have been related to the circulation control airfoil performance obtained from direct surface pressure measurements. The analysis shows that wind tunnel wall interference can have significant influence on high lift test results. This influence must be accounted for before wind tunnel test data can be used for design extrapolation or for turbulence modeling and CFD assessments. Corrections have been made for finite aspect ratio wind tunnel wall interference in order to provide interference free benchmark data for turbulence modeling and CFD code development and validation. A substantial amount of additional data awaits analysis.
Author
Circulation Control Airfoils; Wind Tunnel Tests; Trailing Edges; Blowing; Computational Fluid Dynamics; Airfoil Profiles; Aerodynamic Interference

20050196731 NASA Glenn Research Center, Cleveland, OH, USA

A Probabilistic Assessment of NASA Ultra-Efficient Engine Technologies for a Large Subsonic Transport

Tong, Michael T.; Jones, Scott M.; Arcara, Philip C., Jr.; Haller, William J.; [2004]; 8 pp.; In English; ASME Turbo Expo 2004, 14-17 Jun. 2004, Vienna, Austria

Contract(s)/Grant(s): WBS 22-714-09-01

Report No.(s): GT2004-53485; E-14435; No Copyright; Avail: CASI; A02, Hardcopy

NASA's Ultra Efficient Engine Technology (UEET) program features advanced aeropropulsion technologies that include highly loaded turbomachinery, an advanced low-NOx combustor, high-temperature materials, intelligent propulsion controls, aspirated seal technology, and an advanced computational fluid dynamics (CFD) design tool to help reduce airplane drag. A probabilistic system assessment is performed to evaluate the impact of these technologies on aircraft fuel burn and NOx reductions. A 300-passenger aircraft, with two 396-kN thrust (85,000-pound) engines is chosen for the study. The results show that a large subsonic aircraft equipped with the UEET technologies has a very high probability of meeting the UEET Program goals for fuel-burn (or equivalent CO2) reduction (15% from the baseline) and LTO (landing and takeoff) NOx reductions (70% relative to the 1996 International Civil Aviation Organization rule). These results are used to provide guidance for developing a robust UEET technology portfolio, and to prioritize the most promising technologies required to achieve UEET program goals for the fuel-burn and NOx reductions.

Author

Civil Aviation; Computational Fluid Dynamics; Probability Theory; Subsonic Aircraft; NASA Programs; Engine Tests; Technology Assessment

20050196738 Swedish Defence Research Establishment, Linkoeping, Sweden

Business Model Helicopter Unit

Lindell, P. O.; Stjernberger, J.; Pilemalm, S.; Dec. 2004; 88 pp.; In Swedish

Report No.(s): PB2005-107460; FOI-R-1419-SE; No Copyright; Avail: CASI; A05, Hardcopy

Changes in the international peace and conflict balance have resulted in new requirements for the technical systems intended to support the command in the Swedish Armed Forces in the future network and task force based defense. Qualities as dynamics and flexibility will be of great importance in the development of technical systems aimed to support command. These systems must be able to support communication between all units in the Swedish Armed Forces and with civil authorities.

NTIS

Commerce; Helicopters; Military Operations

20050196810 Toledo Univ., OH, USA, NASA Glenn Research Center, Cleveland, OH, USA

Fan Flutter Analysis Capability Enhanced

Bakhle, Milind A.; Srivastava, Rakesh; Stefko, George L.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The trend in the design of advanced transonic fans for aircraft engines has been toward the use of complex high-aspect-ratio blade geometries with a larger number of blades and higher loading. In addition, integrally bladed disks or blisks are being considered in fan designs for their potential to reduce manufacturing costs, weight, and complexity by eliminating attachments. With such design trends, there is an increased possibility within the operating region of part-speed stall flutter (self-excited vibrations) that is exacerbated by the reduced structural damping of blisk fans. To verify the aeroelastic soundness of the design, the NASA Glenn Research Center is developing and validating an accurate aeroelastic prediction and analysis capability. Recently, this capability was enhanced significantly as described here.

Derived from text

Flutter Analysis; Aeroelastic Research Wings; Aircraft Design; Supersonic Aircraft

20050196822 NASA Langley Research Center, Hampton, VA, USA

Transonic-Small-Disturbance and Linear Analyses for the Active Aeroelastic Wing Program

Wiesman, Carol D.; Silva, Walter A.; Spain, Charles V.; Heeg, Jennifer; [2005]; 20 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA

Contract(s)/Grant(s): 23-065-50-22; No Copyright; Avail: CASI; A03, Hardcopy

Analysis serves many roles in the Active Aeroelastic Wing (AAW) program. It has been employed to ensure safe testing of both a flight vehicle and wind tunnel model, has formulated models for control law design, has provided comparison data

for validation of experimental methods and has addressed several analytical research topics. Aeroelastic analyses using mathematical models of both the flight vehicle and the wind tunnel model configurations have been conducted. Static aeroelastic characterizations of the flight vehicle and wind tunnel model have been produced in the transonic regime and at low supersonic Mach numbers. The flight vehicle has been analyzed using linear aerodynamic theory and transonic small disturbance theory. Analyses of the wind-tunnel model were performed using only linear methods. Research efforts conducted through these analyses include defining regions of the test space where transonic effects play an important role and investigating transonic similarity. A comparison of these aeroelastic analyses for the AAW flight vehicle is presented in this paper. Results from a study of transonic similarity are also presented. Data sets from these analyses include pressure distributions, stability and control derivatives, control surface effectiveness, and vehicle deflections.
Author
Aeroelastic Research Wings; Aeroelasticity; Aircraft Structures

20050198858 NASA Glenn Research Center, Cleveland, OH, USA
International Test Program for Synergistic Atomic Oxygen and Vacuum Ultraviolet Radiation Exposure of Spacecraft Materials
Miller, Sharon K.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The components and materials of spacecraft in low Earth orbit can degrade in thermal and optical performance through interaction with atomic oxygen and vacuum ultraviolet (VUV) radiation, which are predominant in low Earth orbit. Because of the importance of low Earth orbit durability and performance to manufacturers and users, an international test program for assessing the durability of spacecraft materials and components was initiated. Initial tests at the NASA Glenn Research Center consisted of exposure of samples representing a variety of thermal control paints, multilayer insulation materials, and Sun sensors that have been used in space. Materials donated from various international sources were tested alongside materials whose performance is well known, such as Teflon FEP, Kapton H, or Z-93-P white paint. The optical, thermal, or mass loss data generated during the tests were then provided to the participating material suppliers. Data were not published unless the participant donating the material consented to publication. The test program is intended to give spacecraft builders and users a better understanding of degradation processes and effects so that they can improve their predictions of spacecraft performance.
Author
Oxygen Atoms; Far Ultraviolet Radiation; Spacecraft Components; Radiation Dosage

20050199061 NASA Langley Research Center, Hampton, VA, USA
Tow-Steered Panels With Holes Subjected to Compression or Shear Loads
Jegley, Dawn C.; Tatting, Brian F.; Guerdal, Zafer; [2005]; 14 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin,TX, USA
Contract(s)/Grant(s): 23-064-30-34
Report No.(s): AIAA Paper 2005-2081; Copyright; Avail: CASI; A03, Hardcopy

Tailoring composite laminates to vary the fiber orientations within a fiber layer of a laminate to address non-uniform stress states and provide structural advantages such as the alteration of principal load paths has potential application to future low-cost, light-weight structures for commercial transport aircraft. Evaluation of this approach requires the determination of the effectiveness of stiffness tailoring through the use of curvilinear fiber paths in flat panels including the reduction of stress concentrations around the holes and the increase in load carrying capability. Panels were designed through the use of an optimization code using a genetic algorithm and fabricated using a tow-steering approach. Manufacturing limitations, such as the radius of curvature of tows the machine could support, avoidance of wrinkling of fibers and minimization of gaps between fibers were considered in the design process. Variable stiffness tow-steered panels constructed with curvilinear fiber paths were fabricated so that the design methodology could be verified through experimentation. Finite element analysis where each element s stacking sequence was accurately defined is used to verify the behavior predicted based on the design code. Experiments on variable stiffness flat panels with central circular holes were conducted with the panels loaded in axial compression or shear. Tape and tow-steered panels are used to demonstrate the buckling, post-buckling and failure behavior of elastically tailored panels. The experimental results presented establish the buckling performance improvements attainable by elastic tailoring of composite laminates.
Author
Laminates; Stress Concentration; Compression Loads; Fiber Orientation; Transport Aircraft; Buckling; Finite Element Method; Stiffness

20050199063 NASA Langley Research Center, Hampton, VA, USA
Persistent Structures in the Turbulent Boundary Layer
Palumbo, Dan; Chabalko, Chris; [2005]; 9 pp.; In English; 11th AIAA/CEAS Aeroacoustics Conference, 23-25 May 2005, Monterey, CA, USA
Contract(s)/Grant(s): 23-781-10-13; Copyright; Avail: CASI; A02, Hardcopy

Persistent structures in the turbulent boundary layer are located and analyzed. The data are taken from flight experiments on large commercial aircraft. An interval correlation technique is introduced which is able to locate the structures. The Morlet continuous wavelet is shown to not only locates persistent structures but has the added benefit that the pressure data are decomposed in time and frequency. To better understand how power is apportioned among these structures, a discrete Coiflet wavelet is used to decompose the pressure data into orthogonal frequency bands. Results indicate that some structures persist a great deal longer in the TBL than would be expected. These structure contain significant power and may be a primary source of vibration energy in the airframe.
Author
Turbulent Boundary Layer; Commercial Aircraft; Airframes; Wavelet Analysis; Vibration

20050199405 NASA Langley Research Center, Hampton, VA, USA
Utilization of the Building-Block Approach in Structural Mechanics Research
Rouse, Marshall; Jegley, Dawn C.; McGowan, David M.; Bush, Harold G.; Waters, W. Allen; [2005]; 19 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA
Contract(s)/Grant(s): 23-719-55-TA; Copyright; Avail: CASI; A03, Hardcopy

In the last 20 years NASA has worked in collaboration with industry to develop enabling technologies needed to make aircraft safer and more affordable, extend their lifetime, improve their reliability, better understand their behavior, and reduce their weight. To support these efforts, research programs starting with ideas and culminating in full-scale structural testing were conducted at the NASA Langley Research Center. Each program contained development efforts that (a) started with selecting the material system and manufacturing approach; (b) moved on to experimentation and analysis of small samples to characterize the system and quantify behavior in the presence of defects like damage and imperfections; (c) progressed on to examining larger structures to examine buckling behavior, combined loadings, and built-up structures; and (d) finally moved to complicated subcomponents and full-scale components. Each step along the way was supported by detailed analysis, including tool development, to prove that the behavior of these structures was well-understood and predictable. This approach for developing technology became known as the 'building-block' approach. In the Advanced Composites Technology Program and the High Speed Research Program the building-block approach was used to develop a true understanding of the response of the structures involved through experimentation and analysis. The philosophy that if the structural response couldn't be accurately predicted, it wasn't really understood, was critical to the progression of these programs. To this end, analytical techniques including closed-form and finite elements were employed and experimentation used to verify assumptions at each step along the way. This paper presents a discussion of the utilization of the building-block approach described previously in structural mechanics research and development programs at NASA Langley Research Center. Specific examples that illustrate the use of this approach are included from recent research and development programs for both subsonic and supersonic transports.
Author
Structural Analysis; Composite Structures; Finite Element Method; Damage; Buckling; Composite Materials

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also *04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics*; and *35 Instrumentation and Photography*.

20050192542 GeoForschungsZentrum, Potsdam, Germany
TIGA: Tide Gauge Benchmark Monitoring Pilot Project
Schoene, Tilo; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 361-364; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The TIGA Pilot Project was initiated in response to the demanding need for highly precise height coordinates and their changes with time at tide gauge benchmarks. TIGA was formally established during the 16th IGS Governing Board Meeting in Nice (April 2001). For the first time it is not the intention of the IGS to provide results with a very low latency, but to have as many stations included as possible. The primary product of the service is time series of coordinates for analyzing vertical motions of Tide Gauges (TG) and Tide Gauge Benchmarks (TGBM). All products will be made public to support and encourage other applications, e.g. sea level studies. In particular, the products of the service will facilitate the distinction between absolute and relative sea level changes by accounting for the vertical uplift of the station, and are, therefore, an important contribution to climate change studies. The service may further contribute to the calibration of satellite altimeters and other oceanographic activities. The pilot project will operate for a period of three years, from 2001 to 2004. After this period the IGS Governing Board will evaluate the project and decide whether or not this activity should become a regular IGS service function.
Derived from text
Measuring Instruments; Time Series Analysis; Coordinates; Vertical Motion

20050192646 NASA Langley Research Center, Hampton, VA, USA
Latency in Visionic Systems: Test Methods and Requirements
Bailey, Randall E.; Arthur, J. J., III; Williams, Steven P.; Kramer, Lynda J.; [2005]; 14 pp.; In English; Workshop on Toward Recommended Methods for Testing and Evaluation of EV and ESV Based Visionic Devices, 26-27 Apr. 2005, Williamsburg, VA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-079-60-10; No Copyright; Avail: CASI; A03, Hardcopy

A visionics device creates a pictorial representation of the external scene for the pilot. The ultimate objective of these systems may be to electronically generate a form of Visual Meteorological Conditions (VMC) to eliminate weather or time-of-day as an operational constraint and provide enhancement over actual visual conditions where eye-limiting resolution may be a limiting factor. Empirical evidence has shown that the total system delays or latencies including the imaging sensors and display systems, can critically degrade their utility, usability, and acceptability. Definitions and measurement techniques are offered herein as common test and evaluation methods for latency testing in visionics device applications. Based upon available data, very different latency requirements are indicated based upon the piloting task, the role in which the visionics device is used in this task, and the characteristics of the visionics cockpit display device including its resolution, field-of-regard, and field-of-view. The least stringent latency requirements will involve Head-Up Display (HUD) applications, where the visionics imagery provides situational information as a supplement to symbology guidance and command information. Conversely, the visionics system latency requirement for a large field-of-view Head-Worn Display application, providing a Virtual-VMC capability from which the pilot will derive visual guidance, will be the most stringent, having a value as low as 20 msec.
Author
Weather; Imaging Techniques; Technology Utilization; Time Lag; Enhanced Vision; Avionics; Head-Up Displays

20050194723 NASA Lewis Research Center, Cleveland, OH, USA
Pyroshock Environments Characterized for Spacecraft Missions
Hughes, William O.; McNelis, Anne M.; Research Technology 1998; April 1999; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Pyrotechnic shock, or pyroshock, is the transient response of a structure to loading induced by the ignition of pyrotechnic (explosive or propellant activated) devices. These devices are typically used to separate structural systems (e.g., separate a spacecraft from a launch vehicle) and deploy appendages (e.g., solar panels). Pyroshocks are characterized by high peak acceleration, high-frequency content, and short duration. Because of their high acceleration and high-frequency, pyroshocks can cause spaceflight hardware to fail. Verifying by test that spaceflight hardware can withstand the anticipated shock environment is considered essential to mission success. The Earth Observing System (EOS) AM-1 spacecraft for NASA's Mission to Planet Earth is scheduled to be launched on an Atlas IIAS vehicle in 1999, and the NASA Lewis Research Center is the launch vehicle integrator for this NASA Goddard Space Flight Center spacecraft. The EOS spacecraft was subjected to numerous ground shock tests to verify that its scientific instruments and avionics components will withstand the shock-induced vibration produced when the spacecraft separates from the launch vehicle. Shock test data from these tests represent the third largest available pyroshock database in the USA. Future spacecraft missions will directly benefit from the knowledge gained from these tests. The payload separation system used for EOS is a new system that operates by firing six separation nuts. This system was tested to verify its functional operation and to characterize the resulting shock levels. The launch vehicle contractor (Lockheed Martin Astronautics) and spacecraft contractor (Lockheed Martin Missiles & Space) completed 16 separation test

firings. This resulted in an unusually large amount of pyroshock data. Typically, only one or two pyroshock test firings are performed for a spacecraft mission. Because of the size of this separation system shock database, engineers were able to perform unique statistical analyses to characterize the distribution of the test data. For example, it was proven that the shock data follow a lognormal distribution, a concept often assumed but rarely proven. The test-to-test repeatability of the shock source level was analyzed, and the effects of various test configurations and separation nut production lots were examined and quantified. Engineers investigated the change in shock level as the shock traveled from the spacecraft separation interface to the avionics components of the upper stage and analyzed the effects of the structural fidelity (simulator versus real) of the components and their weight on vibrational response. In addition, the shock attenuation with distance and across joints was quantified and compared with concepts originally generated in 1970, and the effects of separation nut preload and firing sequences effects were examined. Because of this EOS shock testing and the analyses performed at NASA Lewis, a significant amount of new information on pyroshock and its characteristics is now available to the aerospace industry. We hope that this information will help future spacecraft test planners to perform better and cheaper spacecraft separation shock tests and to better understand their test data.
Author
Pyrotechnics; Shock Tests; Space Missions; Avionics; Launch Vehicles

07
AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power; 28 Propellants and Fuels*; and *44 Energy Production and Conversion*.

20050192615 Cleveland State Univ., Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Vibration-Based Method Developed to Detect Cracks in Rotors During Acceleration Through Resonance
Sawicki, Jerzy T.; Baaklini, George Y.; Gyekenyesi, Andrew L.; Research and Technology 2003; May 2004; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

In recent years, there has been an increasing interest in developing rotating machinery shaft crack-detection methodologies and online techniques. Shaft crack problems present a significant safety and loss hazard in nearly every application of modern turbomachinery. In many cases, the rotors of modern machines are rapidly accelerated from rest to operating speed, to reduce the excessive vibrations at the critical speeds. The vibration monitoring during startup or shutdown has been receiving growing attention (ref. 1), especially for machines such as aircraft engines, which are subjected to frequent starts and stops, as well as high speeds and acceleration rates. It has been recognized that the presence of angular acceleration strongly affects the rotor's maximum response to unbalance and the speed at which it occurs. Unfortunately, conventional nondestructive evaluation (NDE) methods have unacceptable limits in terms of their application for online crack detection. Some of these techniques are time consuming and inconvenient for turbomachinery service testing. Almost all of these techniques require that the vicinity of the damage be known in advance, and they can provide only local information, with no indication of the structural strength at a component or system level. In addition, the effectiveness of these experimental techniques is affected by the high measurement noise levels existing in complex turbomachine structures. Therefore, the use of vibration monitoring along with vibration analysis has been receiving increasing attention.
Derived from text
Rotors; Vibration

20050194591 NASA Glenn Research Center, Cleveland, OH, USA
Acoustics and Thrust of Separate Flow Exhaust Nozzles With Mixing Devices Investigated for High Bypass Ratio Engines
Saiyed, Naseem H.; Research and Technology 1999; March 2000; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Typical installed separate-flow exhaust nozzle system. The jet noise from modern turbofan engines is a major contributor to the overall noise from commercial aircraft. Many of these engines use separate nozzles for exhausting core and fan streams. As a part of NASA s Advanced Subsonic Technology (AST) program, the NASA Glenn Research Center at Lewis Field led an experimental investigation using model-scale nozzles in Glenn s Aero-Acoustic Propulsion Laboratory. The goal of the investigation was to develop technology for reducing the jet noise by 3 EPNdB. Teams of engineers from Glenn, the NASA Langley Research Center, Pratt & Whitney, United Technologies Research Corporation, the Boeing Company, GE Aircraft

Engines, Allison Engine Company, and Aero Systems Engineering contributed to the planning and implementation of the test.
Derived from text
Aeroacoustics; Thrust; Turbine Exhaust Nozzles; Exhaust Nozzles

20050195862 NASA Glenn Research Center, Cleveland, OH, USA
Probabilistic Risk-Based Approach to Aeropropulsion System Assessment Developed
Tong, Michael T.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

In an era of shrinking development budgets and resources, where there is also an emphasis on reducing the product development cycle, the role of system assessment, performed in the early stages of an engine development program, becomes very critical to the successful development of new aeropropulsion systems. A reliable system assessment not only helps to identify the best propulsion system concept among several candidates, it can also identify which technologies are worth pursuing. This is particularly important for advanced aeropropulsion technology development programs, which require an enormous amount of resources. In the current practice of deterministic, or point-design, approaches, the uncertainties of design variables are either unaccounted for or accounted for by safety factors. This could often result in an assessment with unknown and unquantifiable reliability. Consequently, it would fail to provide additional insight into the risks associated with the new technologies, which are often needed by decisionmakers to determine the feasibility and return-on-investment of a new aircraft engine.
Derived from text
Aircraft Engines; Engine Design; Propulsion System Configurations

20050195868 Army Research Lab., Cleveland, OH, USA
Autonomous Propulsion System Technology Being Developed to Optimize Engine Performance Throughout the Lifecycle
Litt, Jonathan S.; Research and Technology 2003; May 2004; 6 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

The goal of the Autonomous Propulsion System Technology (APST) project is to reduce pilot workload under both normal and anomalous conditions. Ongoing work under APST develops and leverages technologies that provide autonomous engine monitoring, diagnosing, and controller adaptation functions, resulting in an integrated suite of algorithms that maintain the propulsion system's performance and safety throughout its life. Engine-to-engine performance variation occurs among new engines because of manufacturing tolerances and assembly practices. As an engine wears, the performance changes as operability limits are reached. In addition to these normal phenomena, other unanticipated events such as sensor failures, bird ingestion, or component faults may occur, affecting pilot workload as well as compromising safety. APST will adapt the controller as necessary to achieve optimal performance for a normal aging engine, and the safety net of APST algorithms will examine and interpret data from a variety of onboard sources to detect, isolate, and if possible, accommodate faults. Situations that cannot be accommodated within the faulted engine itself will be referred to a higher level vehicle management system. This system will have the authority to redistribute the faulted engine's functionality among other engines, or to replan the mission based on this new engine health information. Work is currently underway in the areas of adaptive control to compensate for engine degradation due to aging, data fusion for diagnostics and prognostics of specific sensor and component faults, and foreign object ingestion detection. In addition, a framework is being defined for integrating all the components of APST into a unified system. A multivariable, adaptive, multimode control algorithm has been developed that accommodates degradation-induced thrust disturbances during throttle transients. The baseline controller of the engine model currently being investigated has multiple control modes that are selected according to some performance or operational criteria. As the engine degrades, parameters shift from their nominal values. Thus, when a new control mode is swapped in, a variable that is being brought under control might have an excessive initial error. The new adaptive algorithm adjusts the controller gains on the basis of the level of degradation to minimize the disruptive influence of the large error on other variables and to recover the desired thrust response.
Author
Adaptive Control; Propulsion System Configurations; Autonomy; Multivariable Control; Multisensor Fusion; Management Systems

20050195869 NASA Glenn Research Center, Cleveland, OH, USA
Starting Vortex Identified as Key to Unsteady Ejector Performance
Paxson, Daniel E.; Research and Technology 2003; May 2004; 5 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Unsteady ejectors are currently under investigation for use in some pulse-detonation-engine-based propulsion systems. Experimental measurements made in the past, and recently at the NASA Glenn Research Center, have demonstrated that thrust augmentation can be enhanced considerably when the driver is unsteady. In ejector systems, thrust augmentation is defined as = T(sup Total)/T(sup j), where T(sup Total) is the total thrust of the combined ejector and driving jet and T(sup j) is the thrust due to the driving jet alone. There are three images in this figure, one for each of the named thrust sources. The images are color contours of measured instantaneous vorticity. Each image is an ensemble average of at least 150 phase-locked measurements. The flow is from right to left, and the shape and location of each driver is shown on the far right of each image. The emitted vortex is a clearly defined 'doughnut' of highly vortical (spinning) flow. In these planar images, the vortex appears as two distorted circles, one above, and one below the axis of symmetry. Because they are spinning in the opposite direction, the two circles have vorticity of opposite sign and thus are different colors. There is also a rectangle shown in each image. Its width represents the ejector diameter that was found experimentally to yield the highest thrust augmentation. It is apparent that the optimal ejector diameter is that which just 'captures' the vortex: that is, the diameter bounding the outermost edge of the vortex structure. The exact mechanism behind the enhanced performance is unclear; however, it is believed to be related to the powerful vortex emitted with each pulse of the unsteady driver. As such, particle imaging velocimetry (PIV) measurements were obtained for three unsteady drivers: a pulsejet, a resonance tube, and a speaker-driven jet. All the drivers were tested with ejectors, and all exhibited performance enhancement over similarly sized steady drivers. The characteristic starting vortices of each driver are shown in these images. The images are color contours of measured instantaneous vorticity. Each image is an ensemble average of at least 150 phase-locked measurements. The flow is from right to left. The shape and location of each driver is shown on the far right of each image. The rectangle shown in each image represents the ejector diameter that was found experimentally to yield the highest thrust augmentation. It is apparent that the optimal ejector diameter is that which just 'captures' the vortex: that is, the diameter bounding the outermost edge of the vortex structure. Although not shown, it was observed that the emitted vortex spread as it traveled downstream. The spreading rate for the pulsejet is shown as the dashed lines in the top image. A tapered ejector was fabricated that matched this shape. When tested, the ejector demonstrated superior performance to all those previously tested at Glenn (which were essentially of straight, cylindrical form), achieving a remarkable thrust augmentation of 2. The measured thrust augmentation is shown as a function of ejector length. Also shown are the thrust augmentation values achieved with the straight, cylindrical ejectors of varying diameters. Here, thrust augmentation is plotted as a function of ejector length for several families of ejector diameters. It can be seen that large thrust augmentation values are indeed obtained and that they are sensitive to both ejector length and diameter, particularly the latter. Five curves are shown. Four correspond to straight ejector diameters of 2.2, 3.0, 4.0, and 6.0 in. The fifth curve corresponds to the tapered ejector contoured to bound the emitted vortex. For each curve, there are several data points corresponding to different lengths. The largest value of thrust augmentation is 2.0 for the tapered ejector and 1.81 for the straight ejectors. Regardless of their diameters, all the ejectors trend toward peak performance at a particular leng. That the cross-sectional dimensions of optimal ejectors scaled precisely with the vortex dimensions on three separate pulsed thrust sources demonstrates that the action of the vortex is responsible for the enhanced ejector performance. The result also suggests that, in the absence of a complete understanding of the entrainment and augmentation mechanisms, methods of characterizing starting vortices may be useful for correlating and predicting unsteady ejector performance.
Author
Ejectors; Unsteady Flow; Vortices; Fabrication; Propulsion System Performance

20050195873 NASA Glenn Research Center, Cleveland, OH, USA
Active Closed-Loop Stator Vane Flow Control Demonstrated in a Low-Speed Multistage Compressor
Bright, Michelle M.; Culley, Dennis E.; Strazisar, Anthony J.; Research and Technology 2003; May 2004; 4 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Closed-loop flow control was successfully demonstrated on the surface of stator vanes in NASA Glenn Research Center's Low-Speed Axial Compressor (LSAC) facility. This facility provides a flow field that accurately duplicates the aerodynamics of modern highly loaded compressors. Closed-loop active flow control uses sensors and actuators embedded within engine components to dynamically alter the internal flow path during off-nominal operation in order to optimize engine performance and maintain stable operation.
Derived from text
Feedback Control; Flow Regulators; Vanes; Turbocompressors; Stator Blades

20050195882 NASA Glenn Research Center, Cleveland, OH, USA
Ultra-Efficient Engine Technology (UEET) Program
Manthey, Lori A.; Research and Technology 2000; March 2001; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Ultra-Efficient Engine Technology (UEET) Program includes seven key projects that work with industry to develop and hand off revolutionary propulsion technologies that will enable future-generation vehicles over a wide range of flight speeds. A new program office, the Ultra-Efficient Engine Technology (UEET) Program Office, was formed at the NASA Glenn Research Center to manage an important National propulsion program for NASA. The Glenn-managed UEET Program, which began on October 1, 1999, includes participation from three other NASA centers (Ames, Goddard, and Langley), as well as five engine companies (GE Aircraft Engines, Pratt & Whitney, Honeywell, Allison/Rolls Royce, and Williams International) and two airplane manufacturers (the Boeing Company and Lockheed Martin Corporation). This 6-year, nearly $300 million program will address local air-quality concerns by developing technologies to significantly reduce nitrogen oxide (NOx) emissions. In addition, it will provide critical propulsion technologies to dramatically increase performance as measured in fuel burn reduction that will enable reductions of carbon dioxide (CO2) emissions. This is necessary to address the potential climate impact of long-term aviation growth.
Derived from text
Technology Assessment; Propulsion System Performance; Air Quality

20050195883 NASA Glenn Research Center, Cleveland, OH, USA
Simplified Dynamic Model of Turbine Clearance Developed for Active Clearance Control Studies
Melcher, Kevin J.; Research and Technology 2003; May 2004; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

A simplified analytical model was developed and implemented to simulate changes in turbine tip clearance during the operation of a commercial gas turbine engine. The clearance model is an enabling technology for the fast-response active turbine tip-clearance control being developed by the NASA Glenn Research Center under the Ultra-Efficient Engine Technology Project.
Derived from text
Dynamic Models; Gas Turbine Engines; Mathematical Models

20050196623 DYNACS Engineering Co., Inc., USA, NASA Glenn Research Center, Cleveland, OH, USA
One-Dimensional Spontaneous Raman Measurements Made in a Gas Turbine Combustor
DeGroot, Wilhelmus A.; Hicks, Yolanda R.; Locke, Randy J.; Anderson, Robert C.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Glenn Research Center and the aerospace industry are designing and testing low-emission combustor concepts to build the next generation of cleaner, more fuel efficient aircraft powerplants. These combustors will operate at much higher inlet temperatures and at pressures that are up to 3 to 5 times greater than combustors in the current fleet. From a test and analysis viewpoint, there is an increasing need for measurements from these combustors that are nonintrusive, simultaneous, multipoint, and more quantitative. Glenn researchers have developed several unique test facilities (refs. 1 and 2) that allow, for the first time, optical interrogation of combustor flow fields, including subcomponent performance, at pressures ranging from 1 to 60 bar (1 to 60 atm). Experiments conducted at Glenn are the first application of a visible laser-pumped, one-dimensional, spontaneous Raman-scattering technique to analyze the flow in a high-pressure, advanced-concept fuel injector at pressures thus far reaching 12 bar (12 atm). This technique offers a complementary method to the existing two- and three-dimensional imaging methods used, such as planar laser-induced fluorescence. Raman measurements benefit from the fact that the signal from each species is a linear function of its density, and the relative densities of all major species can be acquired simultaneously with good precision. The Raman method has the added potential to calibrate multidimensional measurements by providing an independent measurement of species number-densities at known points within the planar laser-induced fluorescence images. The visible Raman method is similar to an ultraviolet-Raman technique first tried in the same test facility (ref. 3). However, the visible method did not suffer from the ultraviolet technique's fuel-born polycyclic aromatic hydrocarbon fluorescence interferences.
Author
Raman Spectra; Calibrating; Gas Turbines; Combustion Chambers; Flow Distribution; Polycyclic Aromatic Hydrocarbons; Laser Induced Fluorescence

20050196667 NASA Glenn Research Center, Cleveland, OH, USA
The GE-NASA RTA Hyperburner Design and Development
Lee, Jin-Ho; Winslow, Ralph; Buehrle, Robert J.; June 2005; 22 pp.; In English; 40th Combustion, 28th Airbreathing Propulsion, 22nd Propulsion Systems Hazards and 4th Modeling and Simulation Joint Subcommittee Meetings, 13-17 Jun. 2005, Charleston, SC, USA
Contract(s)/Grant(s): WBS 22-065-92-43
Report No.(s): NASA/TM-2005-213803; E-15160; No Copyright; Avail: CASI; A03, Hardcopy

The Revolutionary Turbine Accelerator (RTA) project is a ground demonstration of a Mach 4 Turbine Based Combined Cycle engine. This new combined cycle engine developed for the ground-based demonstration will use a new type of augmentor called the hyperburner. The technical features of this new augmenter are introduced in this work. Some of the salient features include a new variable area bypass injector system and a new flame holder configuration. A summary of the hyperburner configuration and the supporting evidence obtained during the hyperburner rig experiments show that hyperburner is a viable burner concept capable of meeting the goals of the RTA ground engine demonstration project.
Author
Turbine Engines; Supersonic Speed; Cycles; Burners; Injectors

20050196728 NASA Glenn Research Center, Cleveland, OH, USA
Hydrogen-powered flight
Smith, Timothy D.; [2005]; 5 pp.; In English
Contract(s)/Grant(s): 22-066-10-01
Report No.(s): E-15195; No Copyright; Avail: CASI; A01, Hardcopy

As the Nation moves towards a hydrogen economy the shape of aviation will change dramatically. To accommodate a switch to hydrogen the aircraft designs, propulsion, and power systems will look much different than the systems of today. Hydrogen will enable a number of new aircraft capabilities from high altitude long endurance remotely operated aircraft (HALE ROA) that will fly weeks to months without refueling to clean, zero emissions transport aircraft. Design and development of new hydrogen powered aircraft have a number of challenges which must be addressed before an operational system can become a reality. While the switch to hydrogen will be most outwardly noticeable in the aircraft designs of the future, other significant changes will be occurring in the environment. A switch to hydrogen for aircraft will completely eliminate harmful greenhouse gases such as carbon monoxide (CO), carbon dioxide (CO2), sulfur oxides (SOx), unburnt hydrocarbons and smoke. While these aircraft emissions are a small percentage of the amount produced on a daily basis, their placement in the upper atmosphere make them particularly harmful. Another troublesome gaseous emission from aircraft is nitrogen oxides (NOx) which contribute to ozone depletion in the upper atmosphere. Nitrogen oxide emissions are produced during the combustion process and are primarily a function of combustion temperature and residence time. The introduction of hydrogen to a gas turbine propulsion system will not eliminate NOx emissions; however the wide flammability range will make low NOx producing, lean burning systems feasible. A revolutionary approach to completely eliminating NOx would be to fly all electric aircraft powered by hydrogen air fuel cells. The fuel cells systems would only produce water, which could be captured on board or released in the lower altitudes. Currently fuel cell systems do not have sufficient energy densities for use in large aircraft, but the long term potential of eliminating greenhouse gas emissions makes it an intriguing and important field of research.
Author (revised)
Hydrogen Fuels; Clean Fuels; Aircraft Fuels; Fuel Cells; Aircraft Engines

20050198876 NASA Glenn Research Center, Cleveland, OH, USA
Jet Engine Noise Generation, Prediction and Control, Chapter 86
Huff, Dennis L.; Envia, Edmane; September 20, 2004; 24 pp.; In English
Report No.(s): E-14866; No Copyright; Avail: CASI; A03, Hardcopy

Aircraft noise has been a problem near airports for many years. It is a quality of life issue that impacts millions of people around the world. Solving this problem has been the principal goal of noise reduction research that began when commercial jet travel became a reality. While progress has been made in reducing both airframe and engine noise, historically, most of the aircraft noise reduction efforts have concentrated on the engines. This was most evident during the 1950 s and 1960 s when turbojet engines were in wide use. This type of engine produces high velocity hot exhaust jets during takeoff generating a great deal of noise. While there are fewer commercial aircraft flying today with turbojet engines, supersonic aircraft including high performance military aircraft use engines with similar exhaust flow characteristics. The Pratt & Whitney F100-PW-229, pictured in Figure la, is an example of an engine that powers the F-15 and F-16 fighter jets. The turbofan engine was developed

for subsonic transports, which in addition to better fuel efficiency also helped mitigate engine noise by reducing the jet exhaust velocity. These engines were introduced in the late 1960 s and power most of the commercial fleet today. Over the years, the bypass ratio (that is the ratio of the mass flow through the fan bypass duct to the mass flow through the engine core) has increased to values approaching 9 for modern turbofans such as the General Electric s GE-90 engine (Figure lb). The benefits to noise reduction for high bypass ratio (HPBR) engines are derived from lowering the core jet velocity and temperature, and lowering the tip speed and pressure ratio of the fan, both of which are the consequences of the increase in bypass ratio. The HBPR engines are typically very large in diameter and can produce over 100,000 pounds of thrust for the largest engines. A third type of engine flying today is the turbo-shaft which is mainly used to power turboprop aircraft and helicopters. An example of this type of engine is shown in Figure IC, which is a schematic of the Honeywell T55 engine that powers the CH-47 Chinook helicopter. Since the noise from the propellers or helicopter rotors is usually dominant for turbo-shaft engines, less attention has been paid to these engines in so far as community noise considerations are concerned. This chapter will concentrate mostly on turbofan engine noise and will highlight common methods for their noise prediction and reduction.
Derived from text
Aerodynamic Noise; Aircraft Noise; Engine Noise; Handbooks; Noise Reduction

20050198946 NASA Glenn Research Center, Cleveland, OH, USA
The Challenges Facing Future Conversion Systems for Space Power Applications
Schreiber, Jeffrey; [2004]; 11 pp.; In English; International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA
Contract(s)/Grant(s): WBS 22-972-20-01
Report No.(s): E-14842; No Copyright; Avail: CASI; A03, Hardcopy

High-efficiency, Stirling power convertors have been proposed for space power applications, ranging from relatively low-power radioisotope generators such as the 110 watt SRG110 to the higher-power 100 kWe SP-100. The NASA Glenn Research Center (GRC) has been involved in the supporting technology and development for both of these systems. Although the power levels are quite different, many of the challenges faced by both of these dynamic power conversion systems similar. A major challenge is fund in demonstration of the capability for high reliability and long-life of the power system when the wear mechanisms have been eliminated. A review is presented of the past efforts, including the status of current flight development efforts, and a projection of what the future might bring.
Author
Space Power Reactors; Stirling Engines; Power Converters

20050199071
Propane Vehicle Demonstration Grant Program
Kerr, G.; Aug. 27, 2004; 14 pp.; In English
Report No.(s): DE2005-832986; No Copyright; Avail: Department of Energy Information Bridge

The Propane Vehicle Demonstration Grants was established to demonstrate the benefits of new propane equipment. The US Department of Energy, the Propane Education & Research Council (PERC) and the Propane Vehicle Council (PVC) partnered in this program. The project impacted ten different states, 179 vehicles, and 15 new propane fueling facilities. Based on estimates provided, this project generated a minimum of 1,441,000 new gallons of propane sold for the vehicle market annually. Additionally, two new off-road engines were brought to the market. Projects originally funded under this project were the City of Portland, Colorado, Kansas City, Impco Technologies, Jasper Engines, Maricopa County, New Jersey State, Port of Houston, Salt Lake City Newspaper, Suburban Propane, Mutual Liquid Propane and Ted Johnson.
NTIS
Motor Vehicles; Propane

20050199427 NASA Glenn Research Center, Cleveland, OH, USA, Ohio Aerospace Inst., OH, USA
Engine With Regression and Neural Network Approximators Designed
Patnaik, Surya N.; Hopkins, Dale A.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

At the NASA Glenn Research Center, the NASA engine performance program (NEPP, ref. 1) and the design optimization testbed COMETBOARDS (ref. 2) with regression and neural network analysis-approximators have been coupled to obtain a preliminary engine design methodology. The solution to a high-bypass-ratio subsonic waverotor-topped turbofan engine, which is shown in the preceding figure, was obtained by the simulation depicted in the following figure. This engine is made

of 16 components mounted on two shafts with 21 flow stations. The engine is designed for a flight envelope with 47 operating points. The design optimization utilized both neural network and regression approximations, along with the cascade strategy (ref. 3). The cascade used three algorithms in sequence: the method of feasible directions, the sequence of unconstrained minimizations technique, and sequential quadratic programming. The normalized optimum thrusts obtained by the three methods are shown in the following figure: the cascade algorithm with regression approximation is represented by a triangle, a circle is shown for the neural network solution, and a solid line indicates original NEPP results. The solutions obtained from both approximate methods lie within one standard deviation of the benchmark solution for each operating point. The simulation improved the maximum thrust by 5 percent. The performance of the linear regression and neural network methods as alternate engine analyzers was found to be satisfactory for the analysis and operation optimization of air-breathing propulsion engines (ref. 4).

Author

Engine Design; Regression Analysis; Neural Nets; Design Optimization; Turbofan Engines; Approximation

20050199433 NASA Glenn Research Center, Cleveland, OH, USA

Oil-Free Turbomachinery Being Developed

DellaCorte, Christopher; Valco, Mark J.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

NASA and the Army Research Laboratory (ARL) along with industry and university researchers, are developing Oil-Free technology that will have a revolutionary impact on turbomachinery systems used in commercial and military applications. System studies have shown that eliminating an engine's oil system can yield significant savings in weight, maintenance, and operational costs. The Oil-Free technology (foil air bearings, high-temperature coatings, and advanced modeling) is being developed to eliminate the need for oil lubrication systems on high-speed turbomachinery such as turbochargers and gas turbine engines that are used in aircraft propulsion systems. The Oil-Free technology is enabled by recent breakthroughs in foil bearing load capacity, solid lubricant coatings, and computer-based analytical modeling. During the past fiscal year, a U.S. patent was awarded for the NASA PS300 solid lubricant coating, which was developed at the NASA Glenn Research Center. PS300 has enabled the successful operation of foil air bearings to temperatures over 650 C and has resulted in wear lives in excess of 100,000 start/stop cycles. This leapfrog improvement in performance over conventional solid lubricants (limited to 300 C) creates new application opportunities for high-speed, high-temperature Oil-Free gas turbine engines. On the basis of this break-through coating technology and the world's first successful demonstration of an Oil-Free turbocharger in fiscal year 1999, industry is partnering with NASA on a 3-year project to demonstrate a small, Oil-Free turbofan engine for aeropropulsion.

Author

Foil Bearings; Coating; High Temperature; Turbomachinery; Solid Lubricants; Lubrication Systems

20050199434 NASA Glenn Research Center, Cleveland, OH, USA

Technology Being Developed at Lawrence Berkeley National Laboratory: Ultra-Low- Emission Combustion Technologies for Heat and Power Generation

Cheng, Robert K.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Combustion Technologies Group at Lawrence Berkeley National Laboratory has developed simple, low-cost, yet robust combustion technologies that may change the fundamental design concept of burners for boilers and furnaces, and injectors for gas turbine combustors. The new technologies utilize lean premixed combustion and could bring about significant pollution reductions from commercial and industrial combustion processes and may also improve efficiency. The technologies are spinoffs of two fundamental research projects: An inner-ring burner insert for lean flame stabilization developed for NASA- sponsored reduced-gravity combustion experiments. A low-swirl burner developed for Department of Energy Basic Energy Sciences research on turbulent combustion.

Derived from text

Combustion; Combustion Physics; Emission; Heat Generation; Gas Turbines

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

20050188794 Arizona Univ., Tucson, AZ USA
Atmospheric Compensation Applications and Data
Gardner, James A.; Broadfoot, A. L.; Apr. 2004; 14 pp.; In English
Contract(s)/Grant(s): F19628-00-C-0017; Proj-1010
Report No.(s): AD-A434559; AFRL-VS-HA-TR-2004-1149; No Copyright; Avail: CASI; A03, Hardcopy

Activity on this contract is divided between validation and verification testing of FLAASH and its radiative transport engine 'MODTRAN', and data collection planning and analysis needed to calibrate and validate flight hyperspectral instruments. Major efforts included the atmospheric compensation code 'Fast Line-of-sight Atmospheric Analysis of Spectral Hypercubes: (FLAASH), the MightySat 11.1 Hyperspectral Interferometer (referred to herein as MS 11.1), the Warfighter-1 Hyperspectral Imager (referred to herein as WF-1), the Noble EYE hyperspectral program, and the COMPASS hyperspectral program.
DTIC
Computer Techniques; Flight Instruments; Imagery; Line of Sight; Spectra

20050192638 Georgia Tech Research Inst., Atlanta, GA, USA
Overview of Circulation Control Pneumatic Aerodynamics: Blown Force and Moment Augmentation and Modification as Applied Primarily to Fixed-Wing Aircraft
Englar, Robert J.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 37-99; In English; See also 20050192624; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy

The use of tangential jet blowing over highly curved aerodynamic surfaces has been shown to yield very strong flow entrainment and resulting aerodynamic/hydrodynamic force and moment augmentation or modification with few or even no moving surfaces. Known as Circulation Control (CC) aerodynamics, this concept has been shown to augment airfoil lift coefficient by as much as 8000% of the input blowing jet momentum. This paper presents and discusses a wide range of proven CC applications including: lift or down-force augmentation; drag reduction or increase; roll, pitch, and yaw amplification/control; thrust deflection; stability augmentation; boundary layer control; hydrodynamic devices; automotive applications; pneumatic propulsors; and micro aircraft surfaces; but primarily emphasizes the application to fixed-wing aircraft.
Author
Aerodynamic Forces; Aircraft Configurations; Airfoils; Boundary Layer Control; Drag Reduction; Fixed Wings; Lateral Control

20050195866 NASA Glenn Research Center, Cleveland, OH, USA
Turbofan Engine Simulated in a Graphical Simulation Environment
Parker, Khary I.; Guo, Ten-Huei; Research and Technology 2003; May 2004; 5 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Recently, there has been an increase in the development of intelligent engine technology with advanced active component control. The computer engine models used in these control studies are component-level models (CLM), models that link individual component models of state space and nonlinear algebraic equations, written in a computer language such as Fortran. The difficulty faced in performing control studies on Fortran-based models is that Fortran is not supported with control design and analysis tools, so there is no means for implementing real-time control. It is desirable to have a simulation environment that is straightforward, has modular graphical components, and allows easy access to health, control, and engine parameters through a graphical user interface. Such a tool should also provide the ability to convert a control design into real-time code, helping to make it an extremely powerful tool in control and diagnostic system development. Simulation time management is shown: Mach number versus time, power level angle versus time, altitude versus time, ambient temperature change versus time, afterburner fuel flow versus time, controller and actuator dynamics, collect initial conditions, CAD output, and component-level model: CLM sensor, CAD input, and model output. The Controls and Dynamics Technologies Branch at the NASA Glenn Research Center has developed and demonstrated a flexible, generic turbofan engine simulation platform that can meet these objectives, known as the Modular Aero-Propulsion System Simulation (MAPSS). MAPSS is a Simulink-based implementation of a Fortran-based, modern high pressure ratio, dual-spool, low-bypass, military-type variable-cycle engine with a digital controller. Simulink (The Mathworks, Natick, MA) is a computer-aided control design and simulation package

allows the graphical representation of dynamic systems in a block diagram form. MAPSS is a nonlinear, non-real-time system composed of controller and actuator dynamics (CAD) and component-level model (CLM) modules. The controller in the CAD module emulates the functionality of a digital controller, which has a typical update rate of 50 Hz. The CLM module simulates the dynamics of the engine components and uses an update rate of 2500 Hz, which is needed to iterate to balance mass and energy among system components. The actuators in the CAD module use the same sampling rate as those in the CLM. Two graphs of normalized spool speed versus time in seconds and one graph of normalized average metal temperature versus time in seconds is shown. MAPSS was validated via open-loop and closed-loop comparisons with the Fortran simulation. The preceding plots show the normalized results of a closed-loop comparison looking at three states of the model: low-pressure spool speed, high-pressure spool speed, and the average metal temperature measured from the combustor to the high-pressure turbine. In steady state, the error between the simulations is less than 1 percent. During a transient, the difference between the simulations is due to a correction in MAPSS that prevents the gas flow in the bypass duct inlet from flowing forward instead of toward the aft end, which occurs in the Fortran simulation. A comparison between MAPSS and the Fortran model of the bypass duct inlet flow for power lever angles greater than 35 degrees is shown.
Author
Active Control; Graphical User Interface; Computerized Simulation; Turbofan Engines

20050195891 West Virginia Univ., Morgantown, WV USA
Development of Formation Flight Control Algorithms Using 3 YF-22 Flying Models
Napolitano, Marcello R.; Apr. 2005; 223 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0373
Report No.(s): AD-A434499; AFRL-SR-AR-TR-05-0164; No Copyright; Avail: CASI; A10, Hardcopy

The main objective of this project was to provide a flight demonstration of formation control using UAV research aircraft models. This document will describe the efforts leading to the design, construction, and flight testing of formation control laws using three YF-22 research UAVs designed, built, and instrumented at West Virginia University (WVU). In the selected formation configuration, a radio control (R/C) pilot maintains ground control of the 'leader' aircraft while two autonomous 'follower' aircraft are required to maintain a pre-defined position and orientation with respect to the 'leader' aircraft. The report is organized as follows. First, a description of the aircraft test-bed construction and on-board payload systems will be provided. The following sections will describe the overall design of the formation control laws. Specifically, this design was based on a set of inner and outer loop control laws using a NLDI (non Linear Dynamic Inversion) approach. The implementation of the controller design featured a mathematical model obtained directly from flight data through a PID (Parameter Identification) study. Additional sections will provide a description of the on-board flight control software and simulation work prior to the flight testing activities. A final section will describe the results from an extensive flight testing program. The flight testing activities were articulated in several flight testing of 2-aircraft and 3-aircraft formations.
DTIC
Algorithms; Computer Programs; Flight Control; Flight Tests; Formation Flying

20050196208
High Confidence Reconfigurable Distributed Control
Hickey, Jason; Hauser, John; Murray, Richard; Apr. 2005; 44 pp.; In English
Contract(s)/Grant(s): F33615-98-C-3613; Proj-A04H
Report No.(s): AD-A435114; AFRL-VA-WP-TR-2005-3041; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Caltech/Colorado SEC project developed and tested two major advances in software enabled control: optimization-based control using real-time trajectory generation and logical programming environments for formal analysis of distributed control systems. These two activities, funded under the OCC and HSCC tasks of the SEC, were integrated and tested on the industry-led demonstration using the F-15 and T-33 flight tests.
DTIC
Active Control; Computer Programs; Distributed Parameter Systems; Flight Control; Liquid Phase Epitaxy; Programming Environments

20050196256 Stanford Univ., Stanford, CA USA
Software Enabled Control. Design of Hierarchical, Hybrid Systems
Tomlin, Claire J.; Jan. 2005; 37 pp.; In English
Contract(s)/Grant(s): F33615-99-C-3014; Proj-A04H
Report No.(s): AD-A435200; AFRL-VA-WP-TR-2005-3053; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this effort is to develop a hybrid control theory for multiple UAVs. Specifically, to develop: A) A hybrid interface between discrete and continuous systems, B) A coordination algorithm for UAVs with distributed sensors. Application areas are air traffic control and satellite formation flight. 1) Real time hybrid system analysis and controller design, 2) Distributed sensing systems, and 3) Asynchronous control theory. Hybrid design (1) is based on solving a constrained optimization problem. This is solved using LMIs with ellipsoidal bounding. The discrete modes use a theorem proven to validate that the modes transition correctly. Distributed sensing (2) is based on precision control of formations of UAVs or satellites with SAR or optical interferometry. Coordinated video ad motion is used to estimate position and resolve conflicts. Asynchronous theory (3) is needed for an effective distributed control architecture. Data is time stamped and weighed with value over time.
DTIC
Air Traffic Control; Artificial Satellites; Computer Programs; Formation Flying; Pilotless Aircraft

20050196629 Naval Surface Warfare Center, Bethesda, MD, USA
Selected Topics Related to Operational Applications of Circulation Control
Rogers, Ernest O.; Abramson, Jane; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 743-770; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The topics are: 1. Techniques for exploring new CC application ideas: 3D panel-methods (inviscid), usage and validation modeling of rotary devices. Checklists: initial concept examination; slot flow power accounting 2. Assorted items: Lift: behavior under conditions of very low or negative Vjet. Drag: the airfoil measurement correction term. 3. Recommendations of tasks to support future applications.
Derived from text
Airfoils; Automatic Control; Lift Drag Ratio

20050196634 Office of Naval Research, Arlington, VA, USA
Circulation Control: Issues for Naval Applications
Joslin, Ronald D.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 553-575; In English; See also 20050196628; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The application, investigation, and modeling of circulation control are the focus of this workshop and resulting proceedings. Most of the papers in this workshop either experimentally observe performance gains using circulation control or attempt to predict such performance gains with computational fluid dynamics. This paper will highlight the successful implementation of circulation control for some naval aircraft demonstrations. Issues are then raised for the potential application of circulation control for undersea platforms.
Author
Computational Fluid Dynamics; Military Aircraft; Circulation Control Airfoils; Circulation Control Rotors

20050196636 Vortex Dynamics Pty. Ltd., Australia
Commercial Applications of Circulation Control
Day, Terence R.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 934-946; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Commercial applications include: wind turbines, orbital pumps, jetfan coanda vacuum cleaner, jetfan driven coanda ceiling fan, and jetfan as a water pump.
Derived from text
Coanda Effect; Wind Turbines; Pumps; Sprayers; Vacuum

20050196640 Manchester Univ., UK

The Use of Circulation Control for Flight Control

Frith, Steven; Wood, Norman; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 675-688; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The objectives of this project are: (a) To investigate various trailing edge configurations with a view to optimizing the circulation control system on a delta wing; (b) To determine whether the leading edge vortex contributes to the circulation control characteristics; and (c) To extend circulation control as a flight control device as well as providing high lift.

Author

Control Equipment; Delta Wings; Flight Control; Vortices

20050196642 Pennsylvania State Univ., State College, PA, USA

Simulation of Steady Circulation Control for the General Aviation Circulation Control (GACC) Wing

Baker, Warren J.; Paterson, Eric G.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 791-811; In English; See also 20050196628; Original contains color and black and white illustrations

Contract(s)/Grant(s): N00014-03-1-0122; No Copyright; Avail: CASI; A03, Hardcopy

The aerodynamic characteristics of the General Aviation Circulation Control (GACC) airfoil have been investigated using non time-accurate, 2D, Reynolds-averaged Navier- Stokes simulations with a blended k-omega/k-epsilon turbulence model. An initial study has been completed to determine the most efficient and accurate method to model the jet flow introduction. Convergence histories show that modeling the jet at the jet orifice, instead of including a plenum decreases computational runtime by a factor of 4, while obtaining accurate results as compared to experiment. A 3-point grid study with the square root of 2 refinement was completed for the computational domain without the plenum. Monotonic convergence was not achieved for the grid study, as the convergence rate of (Deltax(sup 2)) was not consistent with a second order scheme. Results for the fine grid show good agreement of surface pressure over the leading 95% of the foil for a given blowing coefficient. Along the aft 5% of the airfoil, CFDSHIP under predicts the magnitude of both the maxima and minima of surface pressure, located at the two jet-slot exits. Mean lift values agree very well with experiment and previous RANS simulations, but RANS results predict a source of unsteadiness not seen in experiment. This source of unsteadiness may be related to using a large domain approach instead of including the tunnel walls in the computational domain. At larger values of C(sub mu), where no experimental data has been obtained, CFDSHIP simulations differ from previous RANS efforts. The near wall spacing for the coarse and medium grids was insufficient to properly capture the physics of the coanda jet, more specifically, the location of the jet separation. Results for the fine grid RANS simulations are encouraging, and as more data from experiment is obtained, more definitive conclusions may be made.

Author

Circulation Control Airfoils; General Aviation Aircraft; Aerodynamic Characteristics; Reynolds Averaging; Coanda Effect; Blowing

20050196644 West Virginia Univ., WV, USA

Experimental and Computational Investigation into the use of the Coanda Effect on the Bell A821201 Airfoil

Angle, Gerald M., II; Huebsch, Wade W.; Smith, James E.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 889-910; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Tilt-rotor aircraft, e.g. the V-22 'Osprey', experience a unique flow scenario in the vertical flight / hover mode. While hovering, this aircraft impinges its rotor wash upon the main wing, limiting the available lift performance. Circulation control (CC) techniques, such as blowing slots using the Coanda effect, can reduce the down-force felt on the main wing, thus recovering part of the lost lift. Leading and trailing edge blowing slots have been added to experimental and computational models of the V-22 main wing to induce the Coanda effect over the curved leading edge and to align the flow with the trailing-edge flap, in the operationally deployed position of 67 degrees. The overall goal is to reduce the size of the wake region below the main wing and thus reduce the downwash force. Initial experimental results show approximately a 10% reduction in download, while the computational fluid dynamics (CFD) analysis indicates a potential 35% reduction could be achieved. Optimal conditions are currently under investigation.

Author

Airfoils; Coanda Effect; Tilt Rotor Aircraft; Trailing Edge Flaps; Vertical Flight; Hovering; V-22 Aircraft; Control Systems Design

20050196645 Naval Surface Warfare Center, Bethesda, MD, USA
Exploratory Investigations of Circulation Control Technology: Overview for Period 1987-2003 at NSWCCD
Imber, Robin; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 577-602; In English; See also 20050196628; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This presentation covers six of the major CC exploratory investigations that have taken place since the last CC workshop that was held in 1986. The 2-D dual slotted airfoil was designed and tested in 1987 by Jane Abramson. Test documentation can be found in NSWCCD-50-TR-2004/030. The airfoil was the first CC model designed at Carderock to incorporate both upper and lower trailing edge blowing slots. The dual slots provide the ability to produce lift in either direction. The fundamental design objective was to increase the control range so that force control in both directions was available. This plot shows lift coefficient vs. C(sub mu) and reveals that the goal of doubling the control range was met. An unexpected finding was that the performance of the lower slot, in terms of measured lift augmentation, was noticeably better than the upper slot. Derived from text
Aerodynamic Coefficients; Circulation Control Airfoils; Circulation Control Rotors; Lift; Trailing Edges

20050196721 NASA Dryden Flight Research Center, Edwards, CA, USA
Selected Flight Test Results for Online Learning Neural Network-Based Flight Control System
Williams-Hayes, Peggy S.; December 30, 2004; 17 pp.; In English; AIAA 1st Intelligent Systems Technical Conference, 20-23 Sep. 2004, Chicago, IL, USA
Contract(s)/Grant(s): WU 711-60-00-SE-80
Report No.(s): NASA/TM-2004-212857; H-2575; No Copyright; Avail: CASI; A03, Hardcopy

The NASA F-15 Intelligent Flight Control System project team developed a series of flight control concepts designed to demonstrate neural network-based adaptive controller benefits, with the objective to develop and flight-test control systems using neural network technology to optimize aircraft performance under nominal conditions and stabilize the aircraft under failure conditions. This report presents flight-test results for an adaptive controller using stability and control derivative values from an online learning neural network. A dynamic cell structure neural network is used in conjunction with a real-time parameter identification algorithm to estimate aerodynamic stability and control derivative increments to baseline aerodynamic derivatives in flight. This open-loop flight test set was performed in preparation for a future phase in which the learning neural network and parameter identification algorithm output would provide the flight controller with aerodynamic stability and control derivative updates in near real time. Two flight maneuvers are analyzed - pitch frequency sweep and automated flight-test maneuver designed to optimally excite the parameter identification algorithm in all axes. Frequency responses generated from flight data are compared to those obtained from nonlinear simulation runs. Flight data examination shows that addition of flight-identified aerodynamic derivative increments into the simulation improved aircraft pitch handling qualities. Author
F-15 Aircraft; Automatic Flight Control; Aircraft Control; Neural Nets; Flight Tests

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see *03 Air Transportation and Safety*. For astronautical facilities see *14 Ground Support Systems and Facilities (Space)*.

20050192473 NASA Langley Research Center, Hampton, VA, USA
Hypersonic Wind Tunnel Calibration Using the Modern Design of Experiments
Rhode, Matthew N.; DeLoach, Richard; [2005]; 27 pp.; In English; 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA
Contract(s)/Grant(s): 23-090-80-40
Report No.(s): AIAA Paper 2005-4274; No Copyright; Avail: CASI; A03, Hardcopy

A calibration of a hypersonic wind tunnel has been conducted using formal experiment design techniques and response surface modeling. Data from a compact, highly efficient experiment was used to create a regression model of the pitot pressure as a function of the facility operating conditions as well as the longitudinal location within the test section. The new calibration utilized far fewer design points than prior experiments, but covered a wider range of the facility s operating envelope while revealing interactions between factors not captured in previous calibrations. A series of points chosen randomly within the

design space was used to verify the accuracy of the response model. The development of the experiment design is discussed along with tactics used in the execution of the experiment to defend against systematic variation in the results. Trends in the data are illustrated, and comparisons are made to earlier findings.
Author
Experiment Design; Hypersonic Wind Tunnels; Mathematical Models; Calibrating

20050192549 NASA Goddard Space Flight Center, Greenbelt, MD, USA
IGS Data Center Working Group Report
Noll, Carey E.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 231; In English; See also 20050192500; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

At its 18th meeting held December 09, 2001 in San Francisco, the IGS Governing Board recommended the formation of a working group to focus on data center issues. This working group will tackle many of the problems facing the IGS data centers as well as develop new ideas to aid users both internal and external to the IGS. The direction of the IGS has changed since its start in 1992 and many new working groups, projects, data sets, and products have been created and incorporated into the service since that time. Therefore, this may be an appropriate time to revisit the requirements of data centers within the IGS.
Derived from text
Information Systems; Global Positioning System; Security

20050194726 NASA Lewis Research Center, Cleveland, OH, USA
Traversing Microphone Track Installed in NASA Lewis' Aero-Acoustic Propulsion Laboratory Dome
Bauman, Steven W.; Perusek, Gail P.; Research and Technology 1998; April 1999; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Aero-Acoustic Propulsion Laboratory is an acoustically treated, 65-ft-tall dome located at the NASA Lewis Research Center. Inside this laboratory is the Nozzle Acoustic Test Rig (NATR), which is used in support of Advanced Subsonics Technology (AST) and High Speed Research (HSR) to test engine exhaust nozzles for thrust and acoustic performance under simulated takeoff conditions. Acoustic measurements had been gathered by a far-field array of microphones located along the dome wall and 10-ft above the floor. Recently, it became desirable to collect acoustic data for engine certifications (as specified by the Federal Aviation Administration (FAA)) that would simulate the noise of an aircraft taking off as heard from an offset ground location. Since nozzles for the High-Speed Civil Transport have straight sides that cause their noise signature to vary radially, an additional plane of acoustic measurement was required. Desired was an arched array of 24 microphones, equally spaced from the nozzle and each other, in a 25 off-vertical plane. The various research requirements made this a challenging task. The microphones needed to be aimed at the nozzle accurately and held firmly in place during testing, but it was also essential that they be easily and routinely lowered to the floor for calibration and servicing. Once serviced, the microphones would have to be returned to their previous location near the ceiling. In addition, there could be no structure could between the microphones and the nozzle, and any structure near the microphones would have to be designed to minimize noise reflections. After many concepts were considered, a single arched truss structure was selected that would be permanently affixed to the dome ceiling and to one end of the dome floor.
Derived from text
Microphones; Test Chambers; Test Facilities; Aeroacoustics; Acoustic Measurement

20050195831 Army Research Lab., Cleveland, OH, USA
New High-Temperature Turbine Seal Rig Fabricated
Delgado, Irebert R.; Research and Technology 1999; March 2000; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Current NASA program goals for aircraft engines and vehicle performance include reducing direct operating costs for commercial aircraft by 3 percent in large engines and 5 percent in regional engines, reducing engine fuel burn up to 10 percent, and reducing engine oxides of nitrogen emissions by more than 50 percent. Significant advancements in current gas turbine engines and engine components, such as seals, are required to meet these goals. Specifically, advanced seals have been identified as critical in meeting engine goals for specific fuel consumption, thrust-to-weight ratio, emissions, durability, and operating costs. In a direct effort to address and make progress toward these goals, researchers at the NASA Glenn Research Center at Lewis Field have developed a unique high-temperature, high-speed engine seal test rig to evaluate seals under the

temperature, speed, and pressure conditions anticipated for next generation turbine engines. This new seal test rig has capabilities beyond those of any existing seal rigs. It can test air seals (i.e., labyrinth, brush, and new seal concepts) at temperatures of up to 1500 F and pressures up to 100 psid (even higher pressures are possible at lower temperatures), and at all surface speeds anticipated in future NASA (Ultra Efficient Engine Technology, UEET, and Integrated High-Performance Turbine Engine Technology, IHPTET) engine programs. In addition, seals can be tested offset from the rotor centerline, in the rotor runout condition, and with simulated mission profiles. Support for this new rig was provided by NASA Glenn, the U.S. Air Force, and the U.S. Army.
Author
Seals (Stoppers); Test Stands

20050196180 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Placing Antifreeze Concrete at Grand Forks Air Force Base
Korhonen, Charles; Semen, Peter; Apr. 2005; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435078; ERDC/CRREL TR-04-9; No Copyright; Avail: Defense Technical Information Center (DTIC)
The first airfield pavement application of a recently developed antifreeze technology for cold weather concreting was demonstrated in February 2004 on an unreinforced section of a parking apron at the Grand Forks Air Force Base (GFAFB) in North Dakota. The technology, which combines ordinary concrete admixtures into a formulation that depresses the freezing point of water and accelerates the hydration rate of portland cement, was the product of a three-year study conducted for the Federal Highway Administration and completed in February 2004. One of the eight admixture combinations developed in that study was used to convert a standard concrete mixture into antifreeze concrete at GFAFB. Two trial batches of concrete made on the day prior to working on the apron afforded the ready-mix producer ample time to adjust admixture dosages to produce a workable concrete. Four truckloads of concrete were sequentially batched at the ready-mix plant and dosed with the antifreeze formulation at the jobsite. Except for the second truckload, which was later discovered to have damaged mixing fins inside its drum, the antifreeze concrete batched in this study behaved like normal fast-setting concrete during mixing, at the time of placement, and throughout finishing. The apron section was ready for traffic two days after placement in subfreezing weather.
DTIC
Admixtures; Antifreezes; Concretes

20050196199 Giordano Automation Corp., Sparta, NJ USA
Turbine Engine Monitoring System (TEMS) Long Term Support Infrastructure
Nolan, Mary; Giordano, Gerard; Esser, Al; deMare, Gregory; May 2005; 40 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-C-0229; Proj-TEMS
Report No.(s): AD-A435104; AFRL-IF-RS-TR-2005-189; No Copyright; Avail: Defense Technical Information Center (DTIC)
Under this contract, initiatives were conducted to improve the sustainment of the Turbine Engine Monitoring System (TEMS). TEMS is deployed on the A-10 and KC-135 aircraft to monitor engine parameters and provide alerts to the ground crew upon the occurrence of Malfunction Transactions (MALTRAN). The TEMS system was designed around 1970's technology, and has numerous sustainment issues because of aging and diminishing manufacturing source (DMS) issues. This program was conducted under a Program Research and Development Authority (PRDA) effort. The efforts represent a true partnership between the two sides of the Air Force that rarely communicate: the R&D side represented by AFRL, and the post-deployment sustainment organization, WR-ALC. The partnership focused on introducing new technologies and innovative solutions to sustainment, and at the same time, provided clear insight to the R&D community the logistic impacts of early design decisions. This Final Report details the various initiatives performed as well as the overall results of each initiative. This includes UDU TPS Development, TEMS OCA TPS Re-Host, TEMS FFSCU Re-Engineering, AGETS Long Term Sustainment Study, AGETS Relay Study, AGETS System Upgrades, AGETS Software Support, FFSCU Emergency Repair for KC-135, A-10 Mishap Investigation, Loop Tester Study: Alternative to Hosting of AIS Functions, and EPU Download.
DTIC
Aircraft Engines; Engine Monitoring Instruments; Gas Turbines; Malfunctions; Turbine Engines; Warning Systems

20050196550 NASA Glenn Research Center, Cleveland, OH, USA

NASA Research Being Shared Through Live, Interactive Video Tours

Petersen, Ruth A.; Zona, Kathleen A.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

On June 2, 2000, the NASA Glenn Research Center Learning Technologies Project (LTP) coordinated the first live remote videoconferencing broadcast from a Glenn facility. The historic event from Glenn's Icing Research Tunnel featured wind tunnel technicians and researchers performing an icing experiment, obtaining results, and discussing the relevance to everyday flight operations and safety. After a brief overview of its history, students were able to 'walk through' the tunnel, stand in the control room, and observe a live icing experiment that demonstrated how ice would grow on an airplane wing in flight through an icing cloud. The tour was interactive, with a spirited exchange of questions and explanations between the students and presenters. The virtual tour of the oldest and largest refrigerated icing research tunnel in the world was the second of a series of videoconferencing connections with the AP Physics students at Bay Village High School, Bay Village, Ohio. The first connection, called Aircraft Safety and Icing Research, introduced the Tailplane Icing Program. In an effort to improve aircraft safety by reducing the number of in-flight icing events, Glenn's Icing Branch uses its icing research aircraft to conduct flight tests. The presenter engaged the students in discussions of basic aircraft flight mechanics and the function of the horizontal tailplane, as well as the effect of ice on airfoil (wing or tail) surfaces. A brief video of actual flight footage provided a view of the pilot's actions and reactions and of the horizon during tailplane icing conditions.

Author

Aircraft Icing; Video Conferencing; Research Facilities; Educational Resources

20050196675 NASA Glenn Research Center, Cleveland, OH, USA

Wind Tunnel Tests Conducted to Develop an Icing Flight Simulator

Ratvasky, Thomas P.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

As part of NASA's Aviation Safety Program goals to reduce aviation accidents due to icing, NASA Glenn Research Center is leading a flight simulator development activity to improve pilot training for the adverse flying characteristics due to icing. Developing flight simulators that incorporate the aerodynamic effects of icing will provide a critical element in pilot training programs by giving pilots a pre-exposure of icing-related hazards, such as ice-contaminated roll upset or tailplane stall. Integrating these effects into training flight simulators will provide an accurate representation of scenarios to develop pilot skills in unusual attitudes and loss-of-control events that may result from airframe icing. In order to achieve a high level of fidelity in the flight simulation, a series of wind tunnel tests have been conducted on a 6.5-percent-scale Twin Otter aircraft model. These wind tunnel tests were conducted at the Wichita State University 7- by 10-ft wind tunnel and Bihrle Applied Research's Large Amplitude Multiple Purpose Facility in Neuburg, Germany. The Twin Otter model was tested without ice (baseline), and with two ice configurations: 1) Ice on the horizontal tail only; 2) Ice on the wing, horizontal tail, and vertical tail. These wind tunnel tests resulted in data bases of aerodynamic forces and moments as functions of angle of attack; sideslip; control surface deflections; forced oscillations in the pitch, roll, and yaw axes; and various rotational speeds. A limited amount of wing and tail surface pressure data were also measured for comparison with data taken at Wichita State and with flight data. The data bases from these tests will be the foundation for a PC-based Icing Flight Simulator to be delivered to Glenn in fiscal year 2001.

Derived from text

Wind Tunnel Tests; Aircraft Icing; Flight Simulators; Pilot Training

20050199432 NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA

New High-Temperature Turbine Seal Rig Installed

Delgado, Irebert R.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Current NASA program goals for aircraft engines and vehicle performance include reducing direct operating costs for commercial aircraft by 3 percent in large engines and 5 percent in regional engines, reducing engine fuel burn up to 10 percent, and reducing engine oxides of nitrogen emissions by more than 50 percent. Significant advancements in current gas turbine engines and engine components, such as seals, are required to meet these goals. Specifically, advanced seals have been identified as critical in meeting engine goals for specific fuel consumption, thrust-to-weight ratio, emissions, durability, and operating costs. In a direct effort to address and make progress toward these goals, researchers at the NASA Glenn Research Center have developed a unique high-temperature, high-speed engine seal test rig to evaluate seals under the temperature, speed, and pressure conditions anticipated for next-generation turbine engines. Newly installed, this seal test rig has

capabilities beyond those of any existing seal rigs. It can test air seals (i.e., labyrinth, brush, and new seal concepts) at temperatures of up to 1500 F and pressures up to 100 psid (even higher pressures are possible at lower temperatures), and at all surface speeds anticipated in future NASA (Ultra-Efficient Engine Technology, UEET) and Integrated High-Performance Turbine Engine Technology (IHPTET) engine programs. In addition, seals can be tested offset from the rotor centerline, in the rotor runout condition, and with simulated mission profiles. Support for this new rig was provided by Glenn, the U.S. Air Force, and the U.S. Army.
Derived from text
Test Facilities; Seals (Stoppers); Engine Parts; Gas Turbine Engines; High Temperature Tests

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

20050188694 Air Univ., Maxwell AFB, AL USA
The Paradigm Shift to Effects-Based Space: Near-Space as a Combat Space Effects Enabler
Tomme, Edward B.; Jan. 2005; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434352; CADRE-2005-01; No Copyright; Avail: CASI; A05, Hardcopy

This paper is an outgrowth of comments I heard and attitudes I experienced at the JFCOM Joint Space Concept Development and Experimentation Workshop in Norfolk at the end of March 2004. I presented a briefing on near-space at the conference along with colleagues from JFCOM, the Army Space and Missile Defense Battlelab, the Naval Research Laboratory, and the Navy Warfare Development Command. It discussed how many functions that are currently done with satellites could be performed for tactical and operational commanders using near-space assets much more cheaply and with much greater operational utility. The briefing was very well received with nothing but positive comments all around. However, once we broke into focus groups trying to develop exercise inputs for such subjects as operationally responsive space, the near-space concept was almost forgotten. It didn't fit into the normal mindset of what space meant, so it was difficult to convince other group members that it should be discussed in the same breath as, say, a TacSat-type program. After much thought, it was my perception that the problem was one of mindset as to what the word 'space' meant to the warfighter. After reading space doctrine (Army, Navy, Air Force, and Joint), I discovered that the mindset I sensed at the workshop had actually been codified to define space as a place where we operate satellites. That mindset is counterproductive.
DTIC
Combat; Communication Satellites; Space Communication

20050188704 Air Univ., Maxwell AFB, AL USA
Military Space Control: An Intuitive Analysis
Fernandez, Adolfo J.; Apr. 2004; 65 pp.; In English
Report No.(s): AD-A434364; AU/AF-FELLOWS/NNN/2004-00; No Copyright; Avail: CASI; A04, Hardcopy

Military space control describes the capability to secure a military asymmetric advantage in space. Space control protects space assets to guarantee access to space services, and at the same time, prevents an enemy from benefiting from resources in space. The tremendous growth in the integration of space systems into today's warfighting machinery is driving a remarkable transition in the military space domain. The growing need for information dominance is the impetus for an increasing military dependence on space services. This reliance on space systems is compelling military decision makers to make key strategic choices about the future of space control. The purpose of this paper is to analyze major aspects of military space control strategy and determine if U.S. initiatives are on track to meet the needs of the warfighter. To analyze U.S. military space control strategy, this research takes an intuitive approach based on a methodology introduced by Newman, Logan, and Hegarty in their book, 'Strategy, A Multi-Level, Integrative Approach.' The method analyzes a strategy by defining the competitive domain, evaluating advantages in resources and organizations, and identifying strategic investment priorities. Based on this approach, the report will address the following three questions: (1) What is the domain the U.S. seeks in the military space control environment?; (2) What is the U.S. space control differential advantage?; and (3) What is the strategic thrust of space control initiatives? The report shows that military space control strategy, like many other facets of space, is in a significant phase of transition. As the military need for information dominance grows, space will become an area the U.S.

will have to defend. This transformation will require moving military operations into space, improving the mission survivability of space systems, and ensuring a continual awareness of activities in space.
DTIC
Aerospace Environments; Aerospace Systems; Defense Program; Military Operations; Policies; Strategy

20050196179 Air Force Academy, CO USA
USA Military Space: Into the Twenty-First Century
Hays, Peter L.; Jan. 2002; 169 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435077; No Copyright; Avail: Defense Technical Information Center (DTIC)

This is the 42nd volume in the Occasional Paper series of the U.S. Air Force Institute for National Security Studies (INSS). This volume presents two important papers on USA military space. The first paper, 'What is Spacepower and Does It Constitute a Revolution in Military Affairs?', examines the concept of 'spacepower' as it is emerging within the U.S. military and business sectors to establish the basis for military space roles and implications. It also posits military-commercial sector linkages as the best near-term road map for future development. As commercial activities expand the importance of USA space, and as technological advances enable military missions, Hays sees expanded military roles, including space weaponization, on the horizon. He concludes that military space has already had a significant impact on the American way of war. That trend will only continue as the promise of a true space-led revolution in military affairs awaits eventual space weaponization. Given an increasingly important U.S. commercial and military presence in space, the second paper, 'Space-Related Arms Control and Regulation to 2015: Precedents and Prospects,' presents a detailed analysis of existing regulations and controls that constrain and shape military space use and development. It also presents a comprehensive examination of current and future issues that will define likely arenas of international efforts to further control military space. The USA must be very aware of the possible consequences for its overall commercial and military space efforts in addressing these issues. Finally, the paper suggests areas where some current regulatory emphasis could benefit the USA, indicating areas for current policy emphasis. Together, the two papers provide a timely and important examination of the current state and the likely future of USA military space.
DTIC
Commerce; Military Operations; Regulations; Security; Space Weapons; United States; Warfare

20050196184 Air Force Academy, CO USA
The Viability of U.S. Anti-Satellite (ASAT) Policy: Moving Toward Space Control
Johnson-Freese, Joan; Jan. 2000; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435085; No Copyright; Avail: Defense Technical Information Center (DTIC)

This is the 30th volume in the Occasional Paper series of the U.S. Air Force Institute for National Security Studies (INSS). It is particularly timely that with the increased emphasis on space within the U.S. Air Force, in light of the ongoing HQ USAF efforts toward air and space integration into a true aerospace force, and in the wake of the 1998 INSS conference 'Spacepower for a New Millennium,' this work represents the initiation of the Space Policy Series of INSS Occasional Papers. In this paper, Dr Joan Johnson-Freese presents an examination of past U.S. policy and international treaty interpretations on anti-satellite weapons (ASAT) in space within the context of the organizational politics surrounding questions of developing and deploying these systems. With the ever-increasing American commercial and military reliance on space, these questions are particularly timely, and it is our hope that the debate on ASATs -- indeed on the larger issues of weaponization of space -- can be better informed by this paper.
DTIC
Law (Jurisprudence); Military Spacecraft; Policies; Politics; Security; Space Weapons; Viability

20050196251 Industrial Coll. of the Armed Forces, Washington, DC USA
Spring 2004 Industry Study: Space Industry
Romano, Anthony F.; Brandt, Linda S.; Burns, Cynthia Q.; Grubbs, Lawrence K.; McGee, Anne E.; Barzler, Paul M.; Bennett, Kathleen R.; Bryner, Drew A.; Clubb, Timothy L.; Flynn, John E.; Jan. 2004; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435195; No Copyright; Avail: Defense Technical Information Center (DTIC)

Space captures the hearts and minds of the world because it represents the future of humanity. Humans are by nature explorers; they seek to understand the unknown and space is a vast unknown. Like all previous pursuits into the unknown by humankind, there are huge risks and challenges associated with the exploration of space. These challenges include the complex

technologies necessary to safely travel the hazardous environment and great distances of space, as well as the public will and commitment of resources required to sustain the long-term drive. Space is an industry full of intrigue worth billions. This industry study report addresses the current condition and challenges of the global space industry and provides recommendations that may ease the journey into this frontier. The report offers an executive summary of the industry, including information on its status and prognosis, an analysis of a few of its major challenges, and recommendations on several important issues. Four essays on major issues are included: Space Technology, Export Controls, Commercial Remote Sensing, and Space Weaponization.
DTIC
Aerospace Engineering; Artificial Satellites; Economics; Forecasting; Industries; Policies; Space Weapons; United States

20050196584 Air Univ., Maxwell AFB, AL USA
Flying Reactors: The Political Feasibility of Nuclear Power in Space
Downey, James R.; Forestier, Anthony M.; Miller, David E.; Apr. 2005; 120 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434910; CADRE-22; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper addresses the question: What mechanism(s) would improve the political feasibility of a nuclear power program for US space operations? For a period of more than 50 years, the USA has been exploring the potential of nuclear-powered reactors for use in a variety of space-based applications. From the earliest days, there have been numerous challenges--some technical, many political--that have impeded progress in every program that the USA has considered. The issues surrounding space nuclear power (SNP) are complex and multifaceted. For the USA, the development of SNP lies at the intersection of program cost benefit and the social perception of risk. The actual decision to employ SNP is finally political--encompassing political judgment, will, and acceptance of risk. But if the current climate surrounding nuclear use remains manifest, the future for SNP looks politically challenging. The specter of a Delta IV rocket carrying a nuclear-powered satellite exploding on launch from Florida is an outcome the US government and its agencies would rather not confront. Though that has never happened, it remains the type of image that the anti-SNP lobby, under the umbrella of groups like the Florida Coalition for Peace and Justice (FCPJ), presents as a potential outcome of SNP programs.
DTIC
Aerospace Environments; Nuclear Reactors; Aerospace Systems

20050196794 Lawrence Livermore National Lab., Livermore, CA USA
Parameter Studies for the VISTA Spacecraft Concept
Orth, C. D.; Nov. 21, 2000; 14 pp.; In English
Report No.(s): DE2005-15013249; UCRL-JC-141513; No Copyright; Avail: Department of Energy Information Bridge

The baseline design for the VISTA spacecraft concept employs a diode-pumped solid-state laser (DPSSL) driver. This type of driver is now under development at LLNL and elsewhere as an extension of the mature solid state (glass) laser technology developed for terrestrial applications of inertial confinement fusion (ICF). A DPSSL is repratable up to at least 30 Hz, and has an efficiency soon to be experimentally verified of at least 10%. By using a detailed systems code including the essential physics of a DPSSL, we have run parameter studies for the baseline roundtrip (RT) to Mars with a 100-ton payload. We describe the results of these studies as a function of the optimized (minimum) RT flight duration. We also demonstrate why DT fuel gives the best performance, although DD, D3He, or even antimatter can be used, and why DT-ignited DD is probably the fuel most preferred. We also describe the overall power flow, showing where the fusion energy is ultimately utilized, and estimate the variation in performance to the planets dictated by variations in target gain and other parameters.
NTIS
Inertial Confinement Fusion; Interplanetary Spacecraft; Manned Spacecraft

13
ASTRODYNAMICS

Includes powered and free flight trajectories; orbital and launching dynamics.

20050196278 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Numerical Analysis for Passive Attitude Stabilization Using a Tethered Balloon on a Gravity Gradient Satellite
Maramba, Ernest M.; Mar. 2005; 120 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435263; AFIT/GA/ENY/05-M07; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research effort analyzes the fundamental dynamics governing a satellite with a gravity gradient boom and a tethered balloon. Satellites that use gravity gradient booms for passive attitude control are characterized by undamped pitch oscillations and no roll control. The tethered balloon acts as a high drag device that accounts for the most drag on the satellite system. By attaching a drag device, the system resists rolling movements while also damping oscillations. This could potentially be a cost effective method for increasing satellite stabilization. The goal of this research is to model the dynamics and determine the feasibility of a gravity gradient stabilized satellite with an attached balloon. A simulation written in Matlab analyzes the behavior of such a satellite. The research is limited to circular orbits around a spherical Earth and includes only in-plane motion for each mass. Stable ranges for certain tether characteristics are found for three different satellites.
DTIC
Artificial Satellites; Attitude (Inclination); Attitude Control; Attitude Stability; Gravity Gradient Satellites; Numerical Analysis; Tethered Balloons

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also *09 Research and Support Facilities (Air)*.

20050192486 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Trial by Fire
Covault, Craig; Aviation Week and Space Technology; July 11, 2005; ISSN 0005-2175; Volume 163, No. 2, pp. 60; In English; Original contains color illustrations; Copyright; Avail: Other Sources

The NASa/ATK Thiokol space shuttle solid rocket motor program has doubled ground test firings and enhanced manufacturing quality and process control to increase safety for Discovery's return to flight. There are a number of places where we've strengthened our engineering and our processes, says Mike Kahn, ATK Thiokol vice president of space launch systems. Protecting the booster against corrosion in the humid Florida environment is one area that has been addressed. Since the loss of Columbia, ATK Thiokol and the Marshall Space Flight Center have completely reevaluated the shuttle solid rocket motor's design certification and found no major problems, Kahn said. The Thiokol solid motors did not play a role in the 2003 Columbia accident, but the motor's older field joint design (since replaced) was the primary cause of the 1986 Challenger accident that killed seven astronauts. The 129 X 12-ft. ATK Thiokol reusable solid rocket motor forms the core of the shuttle's two solid rocket boosters (SRBs). United Space Alliance (USA) has overall responsibility for the booster's nose-mounted systems such as recovery parachutes and aft-mounted thrust vector control systems that increase the length to 149 ft. USA and its subcontractors have also reaffirmed quality control on systems such as the booster's Hamilton Sundstrand hydraulic power units for critical thrust vector control. And to ensure greater safeguards against booster debris jeopardizing the orbiter, a bolt-catcher system to restrain the large bolts, severed at booster separation, was also redesigned.
Derived from text
Booster Rocket Engines; Solid Propellant Rocket Engines; Space Shuttle Boosters

20050192490 NASA, Washington, DC, USA
One More Time
Morring, Frank, Jr.; Aviation Week and Space Technology; July 11, 2005; ISSN 0005-2175; Volume 163, No. 2, pp. 32-33; In English; Original contains color illustrations; Copyright; Avail: Other Sources

NASA engineers on the Hubble Space Telescope program are actively preparing a shuttle mission to service the orbiting observatory, perhaps as early as 2007, pending a safe return to flight of the shuttle fleet. Administrator Michael D. Griffin must give final clearance to mount the mission, scuttled by former Administrator Sean O'Keefe on what he said were safety grounds in the wake of the Columbia accident. But Griffin, who has overturned much of O'Keefe's policy in his three months on the job, has already told the Hubble program to proceed as though the mission will take place. In that, he has at least the acquiescence of Harold Gehman, the retired admiral who headed the Columbia Accident Investigation Board (CAIB). The CAIB never intended its recommendations to preclude a shuttle-borne Hubble servicing mission, Gehman says, and its members still believe the risk would be no greater than missions to the International Space Station (ISS).
Derived from text
Hubble Space Telescope; International Space Station; Space Shuttle Missions

20050192642 NASA Glenn Research Center, Cleveland, OH, USA
Concept Defined for the International Space Station's Fluids and Combustion Facility
Winsa, Edward A.; Research and Technology 1999; March 2000; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Fluids and Combustion Facility (FCF) will occupy three powered racks and one stowage rack on the International Space Station (ISS). It will be a permanent modular, multiuser facility to accommodate microgravity science experiments onboard the ISS s U.S. Laboratory Module. FCF will support NASA Human Exploration and Development of Space program objectives requiring sustained, systematic research in the disciplines of fluid physics and combustion science. The two disciplines share racks and mutually necessary hardware within FCF to dramatically reduce costs and effectively use ISS resources. Even with the cost of FCF development included, experimentation using FCF on the space station will cost only half of what it did on the space shuttles.
Derived from text
Space Programs; Combustion Chambers; Fluid Dynamics; International Space Station

20050192643 DYNACS Engineering Co., Inc., USA
Hubble Space Telescope Program on STS-95 Supported by Space Acceleration Measurement System for Free Flyers
Kacpura, Thomas J.; Research and Technology 1999; March 2000; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

John Glenn's historic return to space was a primary focus of the STS 95 space shuttle mission; however, the 83 science payloads aboard were the focus of the flight activities. One of the payloads, the Hubble Space Telescope Orbital System Test (HOST), was flown in the cargo bay by the NASA Goddard Space Flight Center. It served as a space flight test of upgrade components for the telescope before they are installed in the shuttle for the next Hubble Space Telescope servicing mission. One of the upgrade components is a cryogenic cooling system for the Near Infrared Camera and Multi-Object Spectrometer (NICMOS). The cooling is required for low noise in the receiver's sensitive electronic instrumentation. Originally, a passive system using dry ice cooled NICMOS, but the ice leaked away and must be replaced. The active cryogenic cooler can provide the cold temperatures required for the NICMOS, but there was a concern that it would create vibrations that would affect the fine pointing accuracy of the Hubble platform.
Derived from text
Hubble Space Telescope; Space Transportation System; Acceleration Measurement

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

20050188586 Army Missile Command, Redstone Arsenal, AL USA
LOKI Antiaircraft Free-Flight Rocket System: Historical Summary, December 1947 - November 1955
Cagle, Mary T.; Bjork, Carold F.; Lewis, Richard M.; Newman, Paul; Apr. 1957; 72 pp.; In English
Report No.(s): AD-A434200; ORDGX-6; No Copyright; Avail: CASI; A04, Hardcopy

This special historical monograph on the LOKI Anti-Aircraft Free-Flight Rocket System was compiled for the Office, Chief of Ordnance, in compliance with letter, ORDGX 00/700 4072, subject: 'Historical Monograph on LOKI,' dated 5 February 1957. The material contained herein was furnished in draft form by Mr. Ernest K. Charlton, Chief of the Commodity Coordination Branch, Plans Coordination Office. In connection with this history of the LOKI Rocket System, the reader's attention is invited to the special study entitled 'Design, Development and Production of Rockets and Rocket Launchers,' dated 1 July 1954, which was also prepared for the Office, Chief of Ordnance.
DTIC
Ammunition; Free Flight; Histories; Loki Rocket Vehicle; Sounding Rockets

20050188611 Joint Chiefs of Staff, Washington, DC USA
Joint Doctrine for Space Operations
Aug. 2002; 88 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434234; JCS-PUB-3-14; No Copyright; Avail: CASI; A05, Hardcopy

This publication provides guidelines for planning and conducting joint space operations. It provides space doctrine

fundamentals for all warfighters -air, land, sea, space, and special operations forces; describes the military operational principles associated with support from and through space, and operating in space; explains US Space Command relationships and responsibilities; and establishes a framework for the employment of space forces and space capabilities. This publication has been prepared under the direction of the Chairman of the Joint Chiefs of Staff. It sets forth doctrine to govern the joint activities and performance of the Armed Forces of the USA in joint operations and provides the doctrinal basis for US military involvement in multinational and interagency operations. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders (JFCs) and prescribes doctrine for joint operations and training. It provides military guidance for use by the Armed Forces in preparing their appropriate plans. It is not the intent of this publication to restrict the authority of the JFC from organizing the force and executing the mission in a manner the JFC deems most appropriate to ensure unity of effort in the accomplishment of the overall mission.
DTIC
Military Operations; Space Missions

20050188660 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Maneuver Estimation Model for Relative Orbit Determination
Storch, Tara R.; Mar. 2005; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434307; AFIT/GA/ENY/05-M011; XC-AFRL/DET-15; No Copyright; Avail: Defense Technical Information Center (DTIC)

While the use of relative orbit determination has reduced the difficulties inherent in tracking geosynchronous satellites that are in close proximity, the problem is often compounded by stationkeeping operations or unexpected maneuvers. If a maneuver occurs, observations will no longer fit predicted data, increasing the risk of misidentification and cross-tagging. The goal of this research was to develop a model that will estimate the magnitude, direction, and time of a suspected maneuver performed by a collocated satellite in geosynchronous orbit. Relative motion was modelled using Hill's equations, and least squares estimation was employed to create both a linear non-maneuver model and non-linear maneuver model. Two sets of data (DirecTV 4S and AMC-4) for an actual satellite collocation were obtained from the Air Force Maui Optical and Supercomputing (AMOS) site, consisting of differential right ascension and declination. Studies conducted with these observations, along with simulation studies, indicate that it is possible to perform maneuver estimation. It was found, however, that the amount of data required for successful convergence is much greater than that typically obtained for tracking purposes.
DTIC
Earth Orbits; Estimates; Maneuvers; Mathematical Models; Orbit Determination; Synchronous Satellites

20050188670 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Performance Study of Staging Variables on Two-Stage-to-Orbit Reusable Launch Vehicles
Nilsen, James K.; Mar. 2005; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434320; AFIT/GA/ENY/05-M08; No Copyright; Avail: CASI; A04, Hardcopy

The purpose of this research is to investigate the effects of staging variables on Two-Stage-To-Orbit reusable launch vehicles, specifically, the question of what measurable factors play important roles in staging performance. Three different configurations (Rocket-Rocket, Turbojet-Rocket and Turbine Based Combined Cycle-Rocket) were considered. The software, Program to Optimize Simulated Trajectories (POST), was used to analyze these configurations. Vehicle coasting time, staging dynamic pressure and staging Mach number were all varied to determine their influence on the final payload.
DTIC
Launch Vehicles; Reusable Launch Vehicles

20050194721
NASA Lewis Launch Collision Probability Model Developed and Analyzed
Research and Technology 1998; April 1999; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

There are nearly 10,000 tracked objects orbiting the earth. These objects encompass manned objects, active and decommissioned satellites, spent rocket bodies, and debris. They range from a few centimeters across to the size of the MIR space station. Anytime a new satellite is launched, the launch vehicle with its payload attached passes through an area of space in which these objects orbit. Although the population density of these objects is low, there always is a small but finite probability of collision between the launch vehicle and one or more of these space objects. Even though the probability of collision is very low, for some payloads even this small risk is unacceptable. To mitigate the small risk of collision associated

with launching at an arbitrary time within the daily launch window, NASA performs a prelaunch mission assurance Collision Avoidance Analysis (or COLA). For the COLA of the Cassini spacecraft, the NASA Lewis Research Center conducted an in-house development and analysis of a model for launch collision probability. The model allows a minimum clearance criteria to be used with the COLA analysis to ensure an acceptably low probability of collision. If, for any given liftoff time, the nominal launch vehicle trajectory would pass a space object with less than the minimum required clearance, launch would not be attempted at that time. The model assumes that the nominal positions of the orbiting objects and of the launch vehicle can be predicted as a function of time, and therefore, that any tracked object that comes within close proximity of the launch vehicle can be identified. For any such pair, these nominal positions can be used to calculate a nominal miss distance. The actual miss distances may differ substantially from the nominal miss distance, due, in part, to the statistical uncertainty of the knowledge of the objects positions. The model further assumes that these position uncertainties can be described with position covariance matrices. With these, and some additional simplifying assumptions, a closed-form solution for the probability of collision is obtained. This solution provides clear insights into how each of the independent parameters affects the probability of collision. It shows that for a given maximum probability of collision and prior knowledge of the objects position uncertainties and sizes, only knowledge of the nominal closest approach distance is required to make the launch/no launch decision. The model was completed and used for the mission assurance COLA analysis for the Cassini spacecraft, which was launched on a Titan IV/Centaur rocket on October 15, 1997. Although the model was specifically developed for the Cassini mission, it is clearly applicable for other launches as well. The effect of COLA closures on the launch window is shown. The bar represents the entire 140-min launch window on October 15, 1997; the blackened areas represent the loss of launch opportunities due to the potential for a collision with an orbiting object.
Author
Collision Avoidance; Launch Vehicles; Models; Probability Theory; NASA Space Programs

20050196058 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Weight Analysis of Two-Stage-To-Orbit Reusable Launch Vehicles for Military Applications
Caldwell, Richard A.; Mar. 2005; 119 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434888; AFIT/GA/ENY/05-M02; No Copyright; Avail: Defense Technical Information Center (DTIC)
In response to Department of Defense (DoD) requirements for responsive and low-cost space access, this design study provides an objective empty weight analysis of potential reusable launch vehicle (RLV) configurations. Each two-stage-to-orbit (TSTO) RLV has a fixed payload requirement of 20,000 lbf to low Earth orbit. The propulsion systems considered in this study include pure rocket, pure turbine, rocket-based-combined-cycle (RBCC), and turbine-based-combined-cycle (TBCC). The hydrocarbon dual-mode scramjet (DMSJ) engines used in the RBCC and TBCC propulsion systems represent possible applications of the current research being performed in the U.S. Air Force HyTech program. Two sensitivity analyses were then performed on areas of interest directly affecting the propulsion systems in this study, including the effects of orbiter fuel selection, as well as the effects of increasing the turbine installed thrust to weight ratios for the RLVs utilizing afterburning turbine engines. The vertical-takeoff-horizontal-landing (VTHL) RLVs have an empty weight advantage over the horizontal-takeoff-horizontal-landing (HTHL) RLVs. The orbiter propellant switch has either negligible or no empty weight savings for the VTHL RLVs, while it leads to substantial empty weight savings for the HTHL RLVs. For the HTHL RLVs, increasing the turbine installed thrust to weight ratio causes a significant decrease in empty weight.
DTIC
Launch Vehicles; Military Technology; Reusable Launch Vehicles; Weight Analysis

20050196065 Cornell Univ., Ithaca, NY USA
Mission Support for the Communication/Navigation Outage Forecast System
Hysell, D. L.; Dec. 2004; 9 pp.; In English
Contract(s)/Grant(s): F19628-03-C-0067; Proj-1010
Report No.(s): AD-A434897; AFRL-VS-HA-TR-2005-1013; No Copyright; Avail: CASI; A02, Hardcopy
This project provides mission support for the Communication/Navigation Outage Forecast System (C/NOFS) under BAA VS-03-01 during its first 4 years of operation. Cornell is required to support the mission with ground-based radar observations of background ionospheric parameters and of equatorial spread F events from the Jicamarca Radio Observatory near Lima, Peru. In the pre-launch period for C/NOFS, Cornell and Jicamarca contributed to the project by measuring plasma density, drift, temperature, and composition profiles during eight campaign periods. The data were processed and made available to AFRL for model validation and also for the Defense Meteorological Satellite Program (DMSP) CalVal operations. Cornell also developed an extensive collection of codes for processing incoherent scatter data from the Altair radar, which also will provide support for the C/NOFS mission. Finally, Cornell undertook a new theoretical formulation of the ionospheric stability problem

that stresses the role of shear instabilities in preconditioning the post-sunset ionosphere. The work led to the production of two manuscripts (published or in press) and to a number of presentations.
DTIC
Forecasting; Incoherent Scattering; Ionospheric Disturbances; Meteorological Radar; Meteorological Satellites; Navigation; Transmission Loss

20050196076 Space and Missile Systems Organization, Los Angeles AFB, CA USA
Environmental Impact Analysis Process. Final Environmental Assessment U.S. Air Force Advanced Extremely High Frequency Satellite Program (AEHF)
Behrens, Paul; Brown, Karen; Davis, Anthony; Latimer, J. D.; Martin, John C.; Peten, Rachey; Roy, Paula; Wooten, R. C.; Feb. 2001; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434921; No Copyright; Avail: Defense Technical Information Center (DTIC)

The USA Air Force (USAF) currently operates the Milstar satellite system to provide Military Satellite Communication Systems (MILSATCOM) to compliment the Air Force's Satellite Communication System, Navy's Fleet Satellite Communication System, and the Defense Satellite Communication System. Milstar utilizes integrated defense communications controlled from a small, continental USA based force structure. The Milstar I system was designed as an advanced communications network consisting of three primary elements: a constellation of six satellites, a satellite ground control systems, and individual user terminals. Initially conceived in 1983, this system was designed to meet the joint service requirements to simultaneously provide: (1) the tactical forces with critical command and control communications, (2) the National Command Authorities (NCA) with Single Integrated Operation Plan (SIOP) execution and (3) the Strategic Forces with direction and report back capability. To meet user requirements, the satellite and terminal communication elements of the Miltar system were designed with a Low Data Rate (LDR) capability.
DTIC
Communication Satellites; Environmental Surveys; Extremely High Frequencies; Military Spacecraft

20050196135 Air Force Academy, CO USA
'All Our Tomorrows': A Long-Range Forecast of Global Trends Affecting Arms Control Technology
Smith, James M.; Larsen, Jeffrey A.; Jun. 2002; 59 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435012; INSS-OP-44; No Copyright; Avail: Defense Technical Information Center (DTIC)

This is the 44th volume in the Occasional Paper series of the USA Air Force Institute for National Security Studies (INSS). This report summarizes a three-phase research project undertaken by the USAF Institute for National Security Studies on behalf of the Defense Threat Reduction Agency to forecast long-range global trends affecting arms control technologies. The report projects the international political, economic, and scientific environments to the year 2015. It posits economic and technological drivers as shaping the system, including its military and political dimensions. The result will be a two-tiered system, with great danger arising from significant proliferation in the second tier and the transition zone between tiers. The report next draws conclusions from this likely future for the scope, value, and practice of arms control. Arms control will be focused less on limitation and reduction of existing weapons, although the endgame between the USA and Russia will remain a significant effort. The focus will shift to the less well-defined realm of counterproliferation, and to marginal, failing, and failed states as well as nontraditional and non-state actors. New dimensions will be added, including control efforts toward small arms, advanced conventional weapons, military space, and information operations. The report then extrapolates from this future to assess the likely arms control technology requirements in cooperative, noncooperative, intrusive, and nonintrusive regimes. The projection here is continuing requirements for each of these specialized sets of technologies, with particular emphasis on multiple-use technologies for remote arms control compliance and verification monitoring as well as for intelligence detection and collection.
DTIC
Forecasting; International Relations; Trend Analysis; Trends; United States

20050196202 Air Force Research Lab., Edwards AFB, CA USA
AFRL MicroPPT Development for Small Spacecraft Propulsion
Spanjers, Gregory G.; Bromaghim, Daron R.; Lake, James; White, David; Schilling, John H.; Bushman, Stewart; Antonsen, Erik L.; Burton, Rodney L.; Keidar, Michael; Boyd, Iain D.; Jul. 2002; 13 pp.; In English
Contract(s)/Grant(s): Proj-1011
Report No.(s): AD-A435108; AIAA-2002-3974; No Copyright; Avail: Defense Technical Information Center (DTIC)

A class of miniaturized pulsed plasma thrusters (PPT), known as MicroPPTs, is currently in development at the Air Force Research Laboratory, Edwards Research Site, California. The MicroPPTs use a surface discharge across solid Teflon propellant to provide precise impulse bits in the 10 micro-newton-per-second range. In the near term, these thrusters can provide propulsive attitude control on 150-kg-class spacecraft using one-fifth the dry mass of conventional torque rods and reaction wheels. Eventually these thrusters are designed for primary and attitude control propulsion on future 25-kg class spacecraft. Efforts to characterize MicroPPT performance and the thruster plume are underway. To this end, a modified torsional thrust stand has been developed for the purpose of accurately measuring the low-level thrust generated by the MicroPPT. A Herriott Cell interferometer is introduced to establish the electron and neutral densities in the thruster plume. Comparison of the measured electron density with modeling predictions shows close agreement. Additionally, a Pockels cell has been developed to provide a zero-impedance MicroPPT breakdown voltage measurement, and an intensified CCD array has been used to characterize the divergence of both the thruster plume and the particulate emission. A synopsis is also presented of the status of the thruster development, including lifetime, thermal, and environmental testing.
DTIC
Miniaturization; Propulsion System Configurations; Propulsion System Performance; Pulsed Plasma Thrusters; Spacecraft Propulsion; Unmanned Spacecraft

20050196268 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Orbit Estimation Algorithms for a Microsatellite Rendezvous With a Non-Cooperative Target
Heslin, John P.; Mar. 2005; 184 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435238; AFIT/GSS/ENY/05-M02; No Copyright; Avail: Defense Technical Information Center (DTIC)
This study investigated the minimum requirements to establish a satellite tracking system architecture for a microsatellite to rendezvous with a non-cooperative target satellite. A prototype optical tracking system was reviewed with emphasis on a proposed tactical employment that could be used by technologically unsophisticated state or non-state adversaries. With the tracking system architecture selected, simulated tracking data was processed with a Non-Linear Least Squares batch orbit estimation algorithm and a Bayes sequential orbit determination filter to update the target satellite's state vector.
DTIC
Algorithms; Artificial Satellites; Microsatellites; Optical Tracking; Satellite Tracking; Targets

20050196546 Aerospace Corp., El Segundo, CA USA
SMC Orbital/Sub-Orbital Debris Mitigation User's Handbook, Version 1.0
Campbell, W. S.; Nerio, D. M.; Jul. 2002; 70 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435172; No Copyright; Avail: Defense Technical Information Center (DTIC)
The purpose of this handbook is to provide Space and Missile Systems Center (SMC) space system developers a reference for use in satisfying DoD and National Space Policy regarding the Mitigation and Control of space debris. Meeting policy objectives involves mitigation of the effects of the debris environment on military space systems as well as mitigation of the effects of military space systems on other users of space. This handbook is intended to be a source of information to assist space system developers, planners, and operators in mitigating the effects of debris to assure minimal impact on their systems and on other users of space through proper design and operations. In addition, this handbook acquaints SMC space system developers with the various types of space hazards as well as current debris mitigation practices of SMC space programs. Metrics for determining the cost effectiveness of mitigation measures will be developed for inclusion in later versions of the handbook.
DTIC
Aerospace Systems; Debris; Handbooks; Manuals; Orbits; Space Debris

16
SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety; 15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20050195875 Analex Corp., USA
Propulsion Integrated Vehicle Health Management Technology Experiment (PITEX) Conducted
Maul, William A.; Chicatelli, Amy K.; Fulton, Christopher E.; Research and Technology 2003; May 2004; 5 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Propulsion Integrated Vehicle Health Management (IVHM) Technology Experiment (PITEX) is a continuing NASA effort being conducted cooperatively by the NASA Glenn Research Center, the NASA Ames Research Center, and the NASA Kennedy Space Center. It was a key element of a Space Launch Initiative risk-reduction task performed by the Northrop Grumman Corporation in El Segundo, California. PITEX's main objectives are the continued maturation of diagnostic technologies that are relevant to second generation reusable launch vehicle (RLV) subsystems and the assessment of the real-time performance of the PITEX diagnostic solution. The PITEX effort has considerable legacy in the NASA IVHM Technology Experiment for X-vehicles (NITEX) that was selected to fly on the X-34 subscale RLV that was being developed by Orbital Sciences Corporation. NITEX, funded through the Future-X Program Office, was to advance the technology-readiness level of selected IVHM technologies within a flight environment and to begin the transition of these technologies from experimental status into RLV baseline designs. The experiment was to perform realtime fault detection and isolation and suggest potential recovery actions for the X-34 main propulsion system (MPS) during all mission phases by using a combination of system-level analysis and detailed diagnostic algorithms.
Author
Spacecraft Launching; Fault Detection; Health; Management Systems; Reusable Launch Vehicles

20050196617 NASA Johnson Space Center, Houston, TX, USA
STS-114 Flight Day 1 Highlights
[2005]; In English; 28 min., 40 sec. playing time, in color, with sound
Report No.(s): BRF-1438A; No Copyright; Avail: CASI; V02, Videotape-VHS; B02, Videotape-Beta
Video coverage of NASA's Return to Flight begins with the pre-flight meal and suit-up of the STS-114 crew (Commander Eileen Collins, Pilot James Kelly, Mission Specialists Soichi Noguchi, Stephen Robinson, Andrew Thomas, Wendy Lawrence, and Charles Camarda), and its departure for the launch pad on the Astrovan. The astronauts board Space Shuttle Discovery and are seated. Arms on the launch pad's Fixed Service Structure pull away, and Discovery is shown from liftoff through booster separation. Video of the ascent from a new camera onboard the External Tank (ET) is included, which features views of the ET's bipod and the tank's separation from the orbiter, with Earth in the background. During a change of shift at Mission Control Center, staff members congratulate the Shuttle crew, and Commander Collins thanks them.
CASI
Discovery (Orbiter); Liftoff (Launching); Spacecrews; Crew Procedures (Preflight); Preflight Operations

20050196704 NASA Johnson Space Center, Houston, TX, USA
STS-114 Flight Day 4 Highlights
[2005]; In English
Report No.(s): BRF-1438D; No Copyright; Avail: CASI; V03, Videotape-VHS; B03, Videotape-Beta
Video coverage of Day 4 continues the Return to Flight mission of STS-114. The crew of Space Shuttle Discovery (Commander Eileen Collins, Pilot James Kelly, Mission Specialists Soichi Noguchi, Stephen Robinson, Andrew Thomas, Wendy Lawrence, and Charles Camarda) and the Expedition 11 crew (Commander Sergei Krikalev and NASA ISS Science Officer and Flight Engineer John Phillips) of the International Space Station (ISS) cooperated on several activities. These were the installation of the Raffaello Multipurpose Logistics Module onto the Common Bearthing Mechanism of the Unity module of the ISS by the Space Station Remote Manipulator System, an interview of Collins and Thomas, primarily focusing on foam shedding and shuttle safety, and use of the Orbiter Boom Sensor System by the Shuttle Remote Manipulator System to follow up on ground-based inspection of the thermal protection beneath Discovery.
CASI
Discovery (Orbiter); International Space Station; Spacecrews; Installing; Multi-Purpose Logistics Modules

20050196708 NASA Johnson Space Center, Houston, TX, USA
STS-114 Flight Day 5 Highlights
July 30, 2005; In English; 33 min., 3 sec. playing time, in color, with sound
Report No.(s): BRF-1438E; No Copyright; Avail: CASI; V03, Videotape-VHS; B03, Videotape-Beta
Highlights of Day 5 of the STS-114 Return to Flight mission (Commander Eileen Collins, Pilot James Kelly, Mission Specialists Soichi Noguchi, Stephen Robinson, Andrew Thomas, Wendy Lawrence, and Charles Camarda) include video coverage of an extravehiclular activity (EVA) by Noguchi and Robinson. The other crew members of Discovery are seen on the flight deck and mid-deck helping the astronauts to suit-up. The objectives of the EVA are to test repair techniques on sample tiles in the shuttle's payload bay, to repair electrical equipment for a gyroscope on the International Space Station

(ISS), and to install a replacement GPS antenna on the ISS. Noguchi and Robinson use a caulk gun and a putty knife to repair the sample tiles. The video contains several Earth views, including one of Baja California.
CASI
Discovery (Orbiter); International Space Station; Spacecrews; Extravehicular Activity; Space Maintenance; Orbital Workers

20050196709 NASA Johnson Space Center, Houston, TX, USA
STS-114 Flight Day 3 Highlights
[2005]; In English; 37 min., 35 sec. playing time, in color, with sound
Report No.(s): BRF-1438C; No Copyright; Avail: CASI; V03, Videotape-VHS; B03, Videotape-Beta

Video coverage of Day 3 includes highlights of STS-114 during the approach and docking of Discovery with the International Space Station (ISS). The Return to Flight continues with space shuttle crew members (Commander Eileen Collins, Pilot James Kelly, Mission Specialists Soichi Noguchi, Stephen Robinson, Andrew Thomas, Wendy Lawrence, and Charles Camarda) seen in onboard activities on the fore and aft portions of the flight deck during the orbiter's approach. Camarda sends a greeting to his family, and Collins maneuvers Discovery as the ISS appears steadily closer in sequential still video from the centerline camera of the Orbiter Docking System. The approach includes video of Discovery from the ISS during the orbiter's Rendezvous Pitch Maneuver, giving the ISS a clear view of the thermal protection systems underneath the orbiter. Discovery docks with the Destiny Laboratory of the ISS, and the shuttle crew greets the Expedition 11 crew (Commander Sergei Krikalev and NASA ISS Science Officer and Flight Engineer John Phillips) of the ISS onboard the station. Finally, the Space Station Remote Manipulator System hands the Orbiter Boom Sensor System to its counterpart, the Shuttle Remote Manipulator System.
CASI
Spacecrews; Discovery (Orbiter); International Space Station; Spacecraft Docking; Space Rendezvous; Crew Procedures (Inflight); Spacecraft Maneuvers

20050196712 NASA Johnson Space Center, Houston, TX, USA
STS-114 Flight Day 6 Highlights
August 2005; In English; 38 min., 11 sec. playing time, in color, with sound
Report No.(s): BRF-1438F; No Copyright; Avail: CASI; V03, Videotape-VHS; B03, Videotape-Beta

Day 6 is a relatively quiet day for the STS-114 crew. The main responsibility for crew members of Space Shuttle Discovery (Commander Eileen Collins, Pilot James Kelly, Mission Specialists Soichi Noguchi, Stephen Robinson, Andrew Thomas, Wendy Lawrence, and Charles Camarda) and the Expedition 11 crew of the International Space Station (ISS) (Commander Sergei Krikalev and NASA ISS Science Officer and Flight Engineer John Phillips) is to unload supplies from the shuttle payload bay and from the Raffaello Multipurpose Logistics Module onto the ISS. Several of the astronauts answer interview questions from the news media, with an emphasis on the significance of their mission for the Return to Flight, shuttle damage and repair, and the future of the shuttle program. Thomas announces the winners of an essay contest for Australian students about the importance of science and mathematics education. The video includes the installation of a stowage rack for the Human Research Facility onboard the ISS, a brief description of the ISS modules, and an inverted view of the Nile Delta.
CASI
Discovery (Orbiter); International Space Station; Spacecrews; Crew Procedures (Inflight); Payload Transfer

20050196714 NASA Johnson Space Center, Houston, TX, USA
STS-114 Flight Day 2 Highlights
[2005]; In English; 25 min., playing time, in color, with sound
Report No.(s): BRF-1438B; No Copyright; Avail: CASI; V02, Videotape-VHS; B02, Videotape-Beta

Video coverage of NASA's Return to Flight continues with highlights from Day 2 of STS-114. After a wake-up song from Mission Control Center, the crew of Space Shuttle Discovery (Commander Eileen Collins, Pilot James Kelly, Mission Specialists Soichi Noguchi, Stephen Robinson, Andrew Thomas, Wendy Lawrence, and Charles Camarda) inspects the orbiter for damage using a camera on the Shuttle Remote Manipulator System (SRMS). The SRMS, a robot arm, extends its length by grappling the new Orbiter Boom Sensor System, in order to image Discovery's wing leading edges and the underside of its nose. After the boom is stowed in the payload bay, the top and sides of the crew cabin are then imaged, including the Reaction Control System jets. The Shuttle's Ku-band antenna is then deployed. The video includes scenes of the payload bay contents, and crew members on the flight deck.
Author
Discovery (Orbiter); Spacecrews; Remote Manipulator System; Inspection; Video Equipment; Booms (Equipment)

20050196715 NASA Johnson Space Center, Houston, TX, USA
STS-114 Flight Day 7 Highlights
August 02, 2005; In English; 24 min., 44 sec. playing time, in color, with sound
Report No.(s): BRF-1438G; No Copyright; Avail: CASI; V02, Videotape-VHS; B02, Videotape-Beta

The main event of Day 7 is an extravehicular activity (EVA) to remove a failed Control Moment Gyroscope (CMG) from the Z1 Truss of the International Space Station (ISS) (Commander Sergei Krikalev and NASA ISS Science Officer and Flight Engineer John Phillips), and install a replacement stored in the payload of Space Shuttle Discovery (Commander Eileen Collins, Pilot James Kelly, Mission Specialists Soichi Noguchi, Stephen Robinson, Andrew Thomas, Wendy Lawrence, and Charles Camarda). Discovery astronauts Noguchi and Robinson are assisted in suit-up by their fellow crew members, Noguchi is carried by the Space Station Remote Manipulator System between Discovery's payload bay and the Z1 truss in order to exchange the gyroscopes with help from the pistol grip tool. Mission Control speaks to him during the EVA in order to troubleshoot the power and data connectors for new CMG. When back in the open payload bay, Noguchi and Robinson pose for pictures of each other and the Earth.
CASI
Discovery (Orbiter); International Space Station; Extravehicular Activity; Space Maintenance; Orbital Workers; Spacecrews; Control Moment Gyroscopes

20050196716 NASA Johnson Space Center, Houston, TX, USA
STS-114 Flight Day 8 Highlights
August 02, 2005; 3 pp.; In English; 29 min., 08 sec. playing time, in color, with sound
Report No.(s): BRF-1438H; No Copyright; Avail: CASI; V02, Videotape-VHS; B02, Videotape-Beta

The major activities of Day 8 for the STS-114 crew of the Space Shuttle Discovery (Commander Eileen Collins, Pilot James Kelly, Mission Specialists Soichi Noguchi, Stephen Robinson, Andrew Thomas, Wendy Lawrence, and Charles Camarda) and the Expedition 11 crew of the International Space Station (ISS) (Commander Sergei Krikalev and NASA ISS Science Officer and Flight Engineer John Phillips) are a press conference and a conversation with President Bush. The two crews are interviewed by American, Japanese, and Russian media. Discovery crew members on the shuttle's mid-deck review paperwork regarding the impending extravehicular activity (EVA) to remove gap fillers from underneath the orbiter, and the Space Station Remote Manipulator System grapples the External Stowage Platform-2 in the Shuttle's payload bay. Finally, Mission control grants the shuttle crew some time off.
CASI
Spacecrews; News Media; Discovery (Orbiter); International Space Station

20050198892 NASA Johnson Space Center, Houston, TX, USA
STS-114 Flight Day 9 Highlights
August 03, 2005; In English; 25 min., 53 sec. playing time, in color, with sound
Report No.(s): BRF-1438I; No Copyright; Avail: CASI; V02, Videotape-VHS; B02, Videotape-Beta

The highlight of Day 9 is the third extravehicular activity (EVA) of the STS-114 mission (Commander Eileen Collins, Pilot James Kelly, Mission Specialists Soichi Noguchi, Stephen Robinson, Andrew Thomas, Wendy Lawrence, and Charles Camarda). Astronauts Noguchi and Robinson are seen preparing for the EVA in the closed payload bay of Space Shuttle Discovery; on the EVA they install on the International Space Station (ISS) a Materials on the International Space Station Experiments (MISSE) unit, an External Stowage Platform (ESP-2), and a wireless antenna. The astronauts are seen working on the ISS under different lighting conditions, and use a pistol-grip tool to remove ESP-2 from the shuttle payload bay. The Space Station Remote Manipulator System then carries Robinson to the underside of the Discovery orbiter, where he communicates with Mission Control during the delicate and unprecedented removal of gap fillers from between the shuttle's tiles. Before and the after the EVA the video includes views of a damaged thermal blanket beneath the shuttle cockpit window. Other views of the shuttle include pans along the underside and topside by the Orbiter Boom Sensor System. The video also includes a view from orbit of Kazakhstan.
CASI
Discovery (Orbiter); Spacecrews; Orbital Workers; Extravehicular Activity; International Space Station; Aerospace Safety; Space Maintenance

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information see also *04 Aircraft Communications and Navigation*; and *32 Communications and Radar*.

20050192508 European Space Agency. European Space Operations Center, Darmstadt, Germany
The ESA/ESOC IGS Analysis Center Technical Report 2002
Romero, I.; Dow, J. M.; Zandbergen, R.; Feltens, J.; Garcia, C.; Boomkamp, H.; Perez, J.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 53-58; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This report gives an overview of the ESOC Analysis Centre activities and a presentation of the IGS activities at ESOC during the year 2002. This year the ESOC AC activities have continued uninterrupted and have consolidated with the timely delivery of all the products part of the IGS and participation in several of the IGS Working Groups and Pilot Projects. There have been no major changes to the routine processing during 2002, only some small changes to the processing strategies as outlined and described in this paper. Currently ESOC's GPS-TDAF (Tracking and data Analysis Facility) handles automatically the ESA ground receiver network, the IGS network data retrieval and storage and all of the routine daily and weekly data processing of the different IGS products. The system is capable of performing autonomous operations for up to five days. Information is available on the website: http://nng.esoc.esa.de/gps/gps.html
Derived from text
European Space Agency; Tracking Networks; Global Positioning System; Data Processing

20050195836 NASA Glenn Research Center, Cleveland, OH, USA
Advanced Communications Technology Satellite (ACTS) Used for Inclined Orbit Operations
Bauer, Robert A.; Research and Technology 1999; March 2000; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Advanced Communications Technology Satellite (ACTS) is operated by the NASA Glenn Research Center at Lewis Field 24 hours a day, 7 days a week. ACTS, which was launched in September 1993, is in its 7th year of operations, far exceeding the system s planned 2 years of operations and 4 years of designed mission life. After 5 successful years of operating as a geostationary satellite, the spacecraft s North-South stationkeeping was discontinued in August 1998. The system is now operating in an inclined orbit that increases at a rate of 0.8 /yr. With only scarce fuel remaining, operating in this mode extends the usage of the still totally functional payload. Although tracking systems are now needed on the experimenter Earth stations, experiment operations have continued with very little disruption. This is the only known geosynchronous Ka-band (30/20 GHz) spot-beam satellite operating in an inclined orbit. The project began its transition from geostationary operations to inclined operations in August 1998. This did not interrupt operations and was transparent to the experimenters on the system. For the space segment, new daily procedures were implemented to maintain the pointing of the system s narrow 0.3 spot beams while the spacecraft drifts in the North-South direction. For the ground segment, modifications were designed, developed, and fielded for the three classes of experimenter Earth stations. With the next generation of commercial satellite systems still being developed, ACTS remains the only operational testbed for Ka-band geosynchronous satellite communications over the Western hemisphere. Since inclined orbit operations began, the ACTS experiments program has supported 43 investigations by industry, Government, and academic organizations, as well as four demonstrations. The project s goals for inclined-orbit operations now reflect a narrower focus in the types of experiments that will be done. In these days of 'faster, better, cheaper,' NASA is seeking to gain greater relevance to the agency s mission from these experiments. One area that is of much interest both to NASA and the commercial world is the investigation of protocol issues related to the interoperability of satellites with terrestrial networks, such as Transmission Control Protocol/Internet Protocol (TCP/IP) and Asynchronous Transfer Mode (ATM) over wideband satellites. Other experiment areas of interest are supporting the U.S. Government and NASA as they begin using commercial space assets to meet their communications needs, evaluating issues related to operating a spot-beam satellite in inclined orbit, and evaluating new Ka-band hardware that requires a satellite link. ACTS is now in its last year of operations. Operations are planned through June 2000, when after 81 months of operations, this very successful spacecraft will be superorbited and made inert.
Author
ACTS; Technology Utilization; Geosynchronous Orbits

20050195837 NASA Glenn Research Center, Cleveland, OH, USA
Satellite Broadcast of Graphical Weather Data Flight Tested
Mallasch, Paul G.; Research and Technology 1999; March 2000; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

NASA Glenn Research Center at Lewis Field's aviation Weather Information Communications (WINCOMM) and NASA Langley Research Center's Aviation Weather Information (AWIN) programs collaborated in a flight test and evaluation of a worldwide weather data-link capability using satellites. This successful flight testing moves NASA closer to its goal of developing advanced communications and information technologies to enable high-quality and timely dissemination of aviation weather information to all relevant users on the aviation information network. Recognized as a major contributing factor in aviation accidents and incidents, weather contributes directly or indirectly to nearly 80 percent of fatal general aviation (small private aircraft) accidents. In 1997, the Aeronautics Safety Investment Strategy Team s weather team produced a prioritized list of investment areas under weather accident prevention. Weather data dissemination is the most critical and highest ranked priority on the list. NASA's Aviation Safety Program founded the Aviation Weather Information initiative to focus efforts on significantly reducing the number of weather-related aviation fatalities. Access to accurate and timely weather data could contribute to a major reduction of weather-related incidents and accidents. However, a cost-effective solution has eluded most general aviation pilots because of the high cost of onboard weather radar equipment. Rockwell Collins, through a contract with NASA and in cooperation with WorldSpace Corporation, successfully completed ground and flight testing of a receiver and antenna in Johannesburg, South Africa. This NASA/Rockwell Collins project is an evaluation of worldwide weather data-link capability using transmissions from the Satellite Digital Audio Radio Services (S DARS) AfriStar satellite. Owned and operated by WorldSpace, AfriStar is a geostationary satellite that broadcasts commercial digital audio services to stationary and mobile platforms. S DARS satellites are the most powerful communications satellites produced to date, allowing users to receive signals using simple, low-cost patch antennas instead of more expensive, beam-steered antenna arrays. Engineers connected an inexpensive, commercially available radio receiver to a laptop computer and an antenna designed and built by Rockwell Collins, enabling them to receive WorldSpace signals from the AfriStar satellite during flight tests. WorldSpace broadcast their composite color graphical weather data files, which were multiplexed with normal audio streams, to the flat patch antenna mounted on a single-engine aircraft. The aircraft was equipped with a modified commercial S-DARS receiver, a Global Positioning Satellite (GPS) receiver, and a laptop computer with color display. Continuous data reception occurred during normal aircraft maneuvers performed throughout takeoff, cruise, and landing operations. In addition, engineers monitored receiver power levels during steep turns and banks. In most instances, the receiver was able to maintain acceptable power levels during all phases of flight and to obtain weather data with little or with the successful completion of ground and flight testing of a receiver and antenna in Johannesburg, South Africa, the team has started to prepare for experiments using highspeed aircraft in areas of the world with limited access to timely weather data. NASA plans to provide a more advanced antenna design and consultation support. This successful test of real-time aviation-related weather data is a positive step toward solving communications-specific issues associated with the dissemination of weather data directly to the cockpit.

Author

Weather; Communication Satellites; Flight Tests; Broadcasting; Computer Graphics

20050195838 NASA Glenn Research Center, Cleveland, OH, USA

Proposal Drafted for Allocating Space-to-Space Frequencies in the GPS Spectrum Bands

Spence, Rodney L.; Research and Technology 1999; March 2000; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Radionavigation Satellite Service (RNSS) systems such as the U.S. Global Positioning System (GPS) and the Russian Global Navigation Satellite System (GLONASS) are primarily being used today in the space-to-Earth direction (i.e., from GPS satellite to Earth user) for a broad range of applications such as geological surveying; aircraft, automobile, and maritime navigation; hiking and mountain climbing; and precision farming and mining. However, these navigation systems are being used increasingly in space. Beginning with the launch of the TOPEX/Poseidon remote-sensing mission in 1992, over 90 GPS receivers have flown onboard spacecraft for such applications as real-time spacecraft navigation, three-axis attitude control, precise time synchronization, precision orbit determination, and atmospheric profiling. In addition to use onboard many science spacecraft, GPS has been used or is planned to be used onboard the shuttles, the International Space Station, the International Space Station Emergency Crew Return Vehicle, and many commercial satellite systems such as Orbcomm, Globalstar, and Teledesic. From a frequency spectrum standpoint, however, one important difference between the space and terrestrial uses of GPS is that it is being used in space with no interference protection. This is because there is no frequency allocation for the space-to-space use of GPS (i.e., from GPS satellite to user spacecraft) in the International Telecommunications Union (ITU) regulatory table of frequency allocations. If another space-based or groundbased radio system interferes with a spaceborne GPS user, the spaceborne user presently has no recourse other than to accept the interference. Consequently, for the past year and a half, the NASA Glenn Research Center at Lewis Field and other Government agencies have been working within ITU toward obtaining a GPS space-to-space allocation at the next World

Radio Conference in the year 2000 (WRC 2000). Numerous interference studies have been conducted in support of a primary space-tospace allocation in the 1215- to 1260-MHz and 1559- to 1610-MHz RNSS bands. Most of these studies and analyses were performed by Glenn and submitted as U.S. input documents to the international Working Party 8D meetings in Geneva, Switzerland. In the structure of the ITU, Working Party 8D is responsible for frequency spectrum issues in the RNSS and the mobile satellite service (MSS). The full texts of the studies are available from the ITU web site under Working Party 8D contributions. Note that because spaceborne RNSS receivers operate in a receive-only mode with navigation signals already being broadcast toward the Earth, the addition of a space-tospace allocation will not result in interference with other systems. A space-based RNSS receiver, however, could experience interference from systems of other services, including intraservice interference from other RNSS systems. The interference scenarios examined in the studies can be inferred from the following frequency allocation charts. In these charts, services labeled in all capital letters (e.g., 'ARNS') have primary status, whereas those labeled with sentence-style capitalization (e.g., 'Amateur radio') have secondary status (i.e., a service with secondary status cannot claim interference protection from or cause harmful interference to a service with primary status). Charts showing the ITU frequency allocations in the 960 to 1350 MHZ range and the 1525-1660 MHZ range are discussed and presented.
Author
Frequencies; Global Positioning System; Spectral Bands; Radio Navigation

20050195839 NASA Glenn Research Center, Cleveland, OH, USA
Low-Cost Tracking Ground Terminal Designed to Use Cryogenically Cooled Electronics
Wald, Lawrence W.; Romanofsky, Robert R.; Warner, Joseph D.; Research and Technology 1999; March 2000; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

A computer-controlled, tracking ground terminal will be assembled at the NASA Glenn Research Center at Lewis Field to receive signals transmitted by the Glenn's Direct Data Distribution (D3) payload planned for a shuttle flight in low Earth orbit. The terminal will enable direct data reception of up to two 622-megabits-per-second (Mbps) beams from the space-based, K-band (19.05-GHz) transmitting array at an end-user bit error rate of up to 10(exp -12). The ground terminal will include a 0.9-m-diameter receive-only Cassegrain reflector antenna with a corrugated feed horn incorporating a dual circularly polarized, K-band feed assembly mounted on a multiaxis, gimbaled tracking pedestal as well as electronics to receive the downlink signals. The tracking system will acquire and automatically track the shuttle through the sky for all elevations greater than 20 above the horizon. The receiving electronics for the ground terminal consist of a six-pole microstrip bandpass filter, a three-stage monolithic microwave integrated circuit (MMIC) amplifier, and a Stirling cycle cryocooler (1 W at 80 K). The Sterling cycle cryocooler cools the front end of the receiver, also known as the low-noise amplifier (LNA), to about 77 K. Cryocooling the LNA significantly increases receiver performance, which is necessary so that it can use the antenna, which has an aperture of only 0.9 m. The following drawing illustrates the cryoterminal.
Author
Ground Stations; Data Processing Terminals; Cassegrain Antennas; Cryogenic Cooling; Microwave Antennas

20050195840 NASA Glenn Research Center, Cleveland, OH, USA
Feasibility Activities Completed for the Direct Data Distribution (D(sup)3) Experiment
Wald, Lawrence W.; Research and Technology 1999; March 2000; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Direct Data Distribution (D(sup 3)) project being designed at the NASA Glenn Research Center at Lewis Field will demonstrate a high-performance communications system that transmits information at up to 1.2 gigabits per second (Gbps) from an advanced technology payload carried by the space shuttles in low Earth orbit to small (0.9-m) autonomously tracking terminals on the Earth. The flight communications package features a solid-state, phased-array antenna operating in the commercial K-band frequency that electronically steers two independently controlled downlink beams toward low-cost tracking ground terminals. The array enables agile, vibration-free beam steering at reduced size and weight with increased reliability over traditional mechanically steered reflectors. The flight experiment will also demonstrate efficient digital modulation technology that allows transmission of substantially increased amounts of latency-tolerant data (up to 72 Gb of data per minute of contact time) with very high quality (10(exp -11) bit error rate). D(sup 3) enables transmission from low-Earth-orbit science spacecraft, the shuttles, or the International Space Station directly to NASA field centers and principle investigator sites, or directly into the commercial terrestrial telecommunications network for remote distribution and archive. The ground terminal features a cryocooled receiver for ultralow noise and a reduced antenna aperture as well as open-loop tracking for unattended operations. The D(sup 3) technology validation and service demonstration will help to facilitate

NASA's transition from using Government-owned communications assets to using commercially provided services.
Derived from text
Feasibility Analysis; Space Shuttle Payloads; Communication Equipment; Space Communication

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SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance; 39 Structural Mechanics*; and *16 Space Transportation and Safety*.

20050196661 NASA Langley Research Center, Hampton, VA, USA
Integrated System-Level Optimization for Concurrent Engineering With Parametric Subsystem Modeling
Schuman, Todd; DeWeck, Oliver L.; Sobieski, Jaroslaw; [2005]; 20 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The introduction of concurrent design practices to the aerospace industry has greatly increased the productivity of engineers and teams during design sessions as demonstrated by JPL's Team X. Simultaneously, advances in computing power have given rise to a host of potent numerical optimization methods capable of solving complex multidisciplinary optimization problems containing hundreds of variables, constraints, and governing equations. Unfortunately, such methods are tedious to set up and require significant amounts of time and processor power to execute, thus making them unsuitable for rapid concurrent engineering use. This paper proposes a framework for Integration of System-Level Optimization with Concurrent Engineering (ISLOCE). It uses parametric neural-network approximations of the subsystem models. These approximations are then linked to a system-level optimizer that is capable of reaching a solution quickly due to the reduced complexity of the approximations. The integration structure is described in detail and applied to the multiobjective design of a simplified Space Shuttle external fuel tank model. Further, a comparison is made between the new framework and traditional concurrent engineering (without system optimization) through an experimental trial with two groups of engineers. Each method is evaluated in terms of optimizer accuracy, time to solution, and ease of use. The results suggest that system-level optimization, running as a background process during integrated concurrent engineering sessions, is potentially advantageous as long as it is judiciously implemented.
Author
Concurrent Engineering; Systems Engineering; Multidisciplinary Design Optimization; Spacecraft Models; Parameterization

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SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20050192553 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Rocket Science: The Shuttle's Main Engines, though Old, Are not Forgotten in the New Exploration Initiative
Covault, Craig; Aviation Week and Space Technology; July 11, 2005; ISSN 0005-2175; Volume 163, No. 2, pp. 59; In English; Original contains color illustrations; Copyright; Avail: Other Sources

The Space Shuttle Main Engine (SSME), developed 30 years ago, remains a strong candidate for use in the new Exploration Initiative as part of a shuttle-derived heavy-lift expendable booster. This is because the Boeing-Rocket- dyne man-rated SSME remains the most highly efficient liquid rocket engine ever developed. There are only enough parts for 12-15 existing SSMEs, however, so one NASA option is to reinitiate SSME production to use it as a throw-away, as opposed to a reusable, powerplant for NASA s new heavy-lift booster.
Derived from text
Liquid Propellant Rocket Engines; Space Shuttle Main Engine

20050194570 NASA Glenn Research Center, Cleveland, OH, USA, NASA Johnson Space Center, Houston, TX, USA, NASA Kennedy Space Center, Cocoa Beach, FL, USA

Power System Options Evaluated for the Radiation and Technology Demonstration Mission

Kerslake, Thomas W.; Benson, Scott W.; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Radiation and Technology Demonstration (RTD) Mission is under joint study by three NASA Centers: the NASA Johnson Space Center, the NASA Goddard Space Flight Center, and the NASA Glenn Research Center at Lewis Field. This Earth-orbiting mission, which may launch on a space shuttle in the first half of the next decade, has the primary objective of demonstrating high-power electric thruster technologies. Secondary objectives include better characterization of Earth's Van Allen trapped-radiation belts, measurement of the effectiveness of the radiation shielding for human protection, measurement of radiation effects on advanced solar cells, and demonstration of radiation-tolerant microelectronics. During the mission, which may continue up to 1 year, the 2000-kg RTD spacecraft will first spiral outward from the shuttle-deployed, medium-inclination, low Earth orbit. By the phased operation of a 10-kW Hall thruster and a 10-kW Variable Specific Impulse Magneto-Plasma Rocket, the RTD spacecraft will reach a low-inclination Earth orbit with a radius greater than five Earth radii. This will be followed by an inward spiraling orbit phase when the spacecraft deploys 8 to 12 microsatellites to map the Van Allen belts. The mission will conclude in low Earth orbit with the possible retrieval of the spacecraft by the space shuttle. A conceptual RTD spacecraft design showing two photovoltaic (PV) array wings, the Hall thruster with propellant tanks, and stowed microsatellites is presented. Early power system studies assessed five different PV array design options coupled with a 120-Vdc power management and distribution system (PMAD) and secondary lithium battery energy storage. Array options include (1) state-of-the-art 10-percent efficient three-junction amorphous SiGe thin-film cells on thin polymer panels deployed with an inflatable (or articulated) truss, (2) SCARLET array panels, (3) commercial state-of-the-art, planar PV array rigid panels with 25-percent efficient, three-junction GaInP2/GaAs/Ge solar cells, (4) rigid panels with 25-percent efficient, three-junction GaInP2/GaAs/Ge solar cells, in a 2 -concentrator trough configuration, and (5) thin polymer panels with 25-percent efficient, three-junction GaInP2/GaAs/Ge solar cells deployed with an inflatable (or articulated) truss. To assess the relative merits of these PV array design options, the study group developed a dedicated Fortran code to predict power system performance and estimate system mass. This code also modeled Earth orbital environments important for accurately predicting PV array performance. The most important environmental effect, solar cell radiation degradation, was calculated from electron-proton fluence input from the industry standard AE8/AP8 trapped radiation models and the concept of damage equivalence. Power systems were sized to provide 10 kW of thruster power and approximately 1 kW of spacecraft power at end of life. Of the five PV array design options, the option 1 (thin-film cells) power system was the most massive 590 kg, whereas the option 4 (trough concentrator) power system was the lightest 260 kg. Arguably, the lowest cost would come from the option 3 (commercial array panels) power system with an acceptable, albeit greater, system mass of 320 kg. Predicted power system performance during the spiral-out mission phase is shown the preceding graph for the option 5 (flexible-panel) array. From the results, the radiation-induced power loss over time is evident as the spacecraft slowly spirals outward through the trapped proton belt. The importance of the spiral trip time is also evident in the two curves representing 74-day and 182-day spiral-out periods. The longer spiral time introduces a beginning-of-life power oversizing penalty greater than 1 kW. Future studies will analyze power system performance and mass with a 50-Vdc power management and distribution architecture favorable to the VASIMR thruster and longer missions.

Author

Space Missions; Radiation Measurement; Technology Utilization; Spacecraft Propulsion; Power Conditioning

20050194572 NASA Glenn Research Center, Cleveland, OH, USA

Power Systems Evaluated for Solar Electric Propulsion Vehicles

Kerslake, Thomas W.; Gefert, Leon P.; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Solar electric propulsion (SEP) mission architectures are applicable to a wide range NASA missions including the robotic exploration of the outer planets in the next decade and the human exploration of Mars within the next 2 decades. SEP enables architectures that are very mass efficient with reasonable power levels (1-MW class) aerobrake and cryogenic upper-stage transportation technologies are utilized. In this architecture, the efficient SEP stage transfers the payload from low Earth orbit (LEO) High Energy Elliptical Parking Orbit (HEEPO) within a period of 6 to 12 months. highthrust, cryogenic upper stage and payload then separate from the SEP vehicle for injection to the planetary target, allowing for fast heliocentric trip times. This mission architecture offers a potential reduction in mass to LEO in comparison to alternative all-chemical nuclear propulsion schemes. Mass reductions may allow launch vehicle downsizing enable missions that would have been grounded because of cost constraints. The preceding figure illustrates a conceptual SEP stage design for a human Mars mission.

Researchers at the NASA Glenn Research Center at Lewis Field designed conceptual SEP vehicle, conceived the mission architecture to use this vehicle, and analyzed the vehicle s performance. This SEP stage has a dry mass of 35 metric tons (MT), 40 MT of xenon propellant, and a photovoltaic array that spans 110 m, providing power to a cluster of eight 100-kW Hall thrusters. The stage can transfer an 80-MT payload and upper stage to the desired HEEPO. Preliminary packaging studies show this space-station-class SEP vehicle meets the proposed 'Magnum' launch vehicle and volume requirements with considerable margin. An SEP vehicle for outer planetary missions, such as the Europa Mapper Mission, would be dramatically smaller than human Mars mission SEP stage. In this mission architecture, the SEP power system with the payload to provide spacecraft power throughout the mission. Several photovoltaic array design concepts were considered for the SEP vehicle power system for the human mission to Mars. These include a space station derivative, a SCARLET (Solar Concentrator Arrays with Refractive Linear Element Technology) derivative, and a hybrid inflatable-deployable thin polymer membrane array with thin-film solar cells (as shown in the concept illustration). This concept is based on a design developed for the Next Generation Space Telescope Sun shield. The array is divided into 16 independent electrical sections with 500-V, negative-grounded solar cell strings. The power system employs a channelized, 500-Vdc power management and distribution (PMAD) architecture with lithium ion batteries for energy storage for vehicle and payload secondary loads (the high-power Hall thrusters do not operate in eclipse periods). The 500-V PMAD voltage permits 'direct-drive' thruster operation, greatly reducing the power processing unit size, complexity, and power loss. Similar power system architecture, designs, and technology are assumed for the Europa Mapper Mission SEP vehicle. The primary exceptions are that the photovoltaic array is assumed to consist of two rectangular wings and that the power system rating is 15 kW in Earth orbit and 200 W at Europa. To size the SEP vehicle power system, a dedicated Fortran code was developed to predict detailed power system performance, mass, and thermal control requirements. This code also modeled all the relevant Earth orbit environments; that is, the particulate radiation, plasma, meteoroids and debris, ultraviolet radiation, contamination, and thermal conditions. Analysis results for the Human Mars Mission SEP vehicle show a power system mass of 9-MT and photovoltaic array area of 5800-square meters for the thin-membrane design concept with CuInS2 thin-film cells. Power processing unit input power for a thin-membrane array design with three-junction, amorphous SiGe solar cells is shown in the graph. Power falls off rapidly inhe first weeks of the mission because of light-induced (Staebler-Wronksi) solar cell losses. During the next 200 days, power decreases steadily as the SEP stage spirals through the proton belts and sustains the bulk of the mission radiation damage. Once the vehicle apogee is above approximately four Earth radii, little additional degradation is incurred. From 400 to 800 days, a 1100-km 'parking' orbit is maintained to await the next payload transfer opportunity. This orbit is below the main proton belt, and thus, little radiation dose is accumulated during this time period. During the second LEO-to-HEEPO transfer, power degrades somewhat further, but power requirements are still met. In comparison, the Europa Mapper SEP vehicle power system had a mass of 150 kg and a thin membrane array area of 100 square meters.
Author
NASA Programs; Solar Electric Propulsion; Spacecraft Design; Power Conditioning; Launch Vehicles

20050195834 NASA Glenn Research Center, Cleveland, OH, USA
Thermal Barriers Developed for Solid Rocket Motor Nozzle Joints
Steinetz, Bruce M.; Dunlap, Patrick H., Jr.; Research and Technology 1999; March 2000; 5 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Space shuttle solid rocket motor case assembly joints are sealed with conventional O-ring seals that are shielded from 5500 F combustion gases by thick layers of insulation and by special joint-fill compounds that fill assembly splitlines in the insulation. On a number of occasions, NASA has observed hot gas penetration through defects in the joint-fill compound of several of the rocket nozzle assembly joints. In the current nozzle-to-case joint, NASA has observed penetration of hot combustion gases through the joint-fill compound to the inboard wiper O-ring in one out of seven motors. Although this condition does not threaten motor safety, evidence of hot gas penetration to the wiper O-ring results in extensive reviews before resuming flight. The solid rocket motor manufacturer (Thiokol) approached the NASA Glenn Research Center at Lewis Field about the possibility of applying Glenn's braided fiber preform seal as a thermal barrier to protect the O-ring seals. Glenn and Thiokol are working to improve the nozzle-to-case joint design by implementing a more reliable J-leg design and by using a braided carbon fiber thermal barrier that would resist any hot gases that the J-leg does not block.
Author (revised)
O Ring Seals; Thermal Insulation; Space Shuttle Boosters; Joints (Junctions); Rocket Engine Cases; Braided Composites

20050196156 Air Force Research Lab., Edwards AFB, CA USA
Materials Modeling for Rocket Propulsion
Boatz, Jerry; Apr. 2005; 23 pp.; In English
Contract(s)/Grant(s): Proj-2303
Report No.(s): AD-A435038; No Copyright; Avail: CASI; A03, Hardcopy

OUTLINE: 1. Introduction; 2. Technical challenges in propellant design; 3. Modeling and Simulation (M&S) techniques & tools: a) Quantum chemistry; b) Molecular dynamics; c) QSPR; d) High Performance Computing (HPC); 4. Examples: a) Identification of suitable target compounds; b) Determination of viable intermediates; c) Confirmation of successful synthesis; 5. Summary and Conclusions.

DTIC

Models; Propulsion; Rocket Propellants; Simulation

20050196551 NASA Glenn Research Center, Cleveland, OH, USA
Coupled-Flow Simulation of HP-LP Turbines Has Resulted in Significant Fuel Savings
Veres, Joseph P.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Our objective was to create a high-fidelity Navier-Stokes computer simulation of the flow through the turbines of a modern high-bypass-ratio turbofan engine. The simulation would have to capture the aerodynamic interactions between closely coupled high- and low-pressure turbines. A computer simulation of the flow in the GE90 turbofan engine's high-pressure (HP) and low-pressure (LP) turbines was created at GE Aircraft Engines under contract with the NASA Glenn Research Center. The three-dimensional steady-state computer simulation was performed using Glenn's average-passage approach named APNASA. The areas upstream and downstream of each blade row mutually interact with each other during engine operation. The embedded blade row operating conditions are modeled since the average passage equations in APNASA actively include the effects of the adjacent blade rows. The turbine airfoils, platforms, and casing are actively cooled by compressor bleed air. Hot gas leaks around the tips of rotors through labyrinth seals. The flow exiting the high work HP turbines is partially transonic and, therefore, has a strong shock system in the transition region. The simulation was done using 121 processors of a Silicon Graphics Origin 2000 (NAS 02K) cluster at the NASA Ames Research Center, with a parallel efficiency of 87 percent in 15 hr. The typical average-passage analysis mesh size per blade row was 280 by 45 by 55, or approx.700,000 grid points. The total number of blade rows was 18 for a combined HP and LP turbine system including the struts in the transition duct and exit guide vane, which contain 12.6 million grid points. Design cycle turnaround time requirements ran typically from 24 to 48 hr of wall clock time. The number of iterations for convergence was 10,000 at 8.03x10(exp -5) sec/iteration/grid point (NAS O2K). Parallel processing by up to 40 processors is required to meet the design cycle time constraints. This is the first-ever flow simulation of an HP and LP turbine. In addition, it includes the struts in the transition duct and exit guide vanes.

Author

Turbines; Turbofan Engines; Ducted Flow; Bypass Ratio; Computerized Simulation; Navier-Stokes Equation; High Pressure; Low Pressure

20050196554 NASA Glenn Research Center, Cleveland, OH, USA
Laser High-Cycle Thermal Fatigue of Pulse Detonation Engine Combustor Materials Tested
Zhu, Dong-Ming; Fox, Dennis S.; Miller, Robert A.; Research and Technology 2000; March 2001; 5 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Pulse detonation engines (PDE's) have received increasing attention for future aerospace propulsion applications. Because the PDE is designed for a high-frequency, intermittent detonation combustion process, extremely high gas temperatures and pressures can be realized under the nearly constant-volume combustion environment. The PDE's can potentially achieve higher thermodynamic cycle efficiency and thrust density in comparison to traditional constant-pressure combustion gas turbine engines (ref. 1). However, the development of these engines requires robust design of the engine components that must endure harsh detonation environments. In particular, the detonation combustor chamber, which is designed to sustain and confine the detonation combustion process, will experience high pressure and temperature pulses with very short durations (refs. 2 and 3). Therefore, it is of great importance to evaluate PDE combustor materials and components under simulated engine temperatures and stress conditions in the laboratory. In this study, a high-cycle thermal fatigue test rig was established at the NASA Glenn Research Center using a 1.5-kW CO2 laser. The high-power laser, operating in the pulsed mode, can be controlled at various pulse energy levels and waveform distributions. The enhanced laser pulses can be used to mimic the time-dependent temperature and pressure waves encountered in a pulsed detonation engine. Under the enhanced

laser pulse condition, a maximum 7.5-kW peak power with a duration of approximately 0.1 to 0.2 msec (a spike) can be achieved, followed by a plateau region that has about one-fifth of the maximum power level with several milliseconds duration. The laser thermal fatigue rig has also been developed to adopt flat and rotating tubular specimen configurations for the simulated engine tests. More sophisticated laser optic systems can be used to simulate the spatial distributions of the temperature and shock waves in the engine. Pulse laser high-cycle thermal fatigue behavior has been investigated on a flat Haynes 188 alloy specimen, under the test condition of 30-Hz cycle frequency (33-msec pulse period and 10-msec pulse width including a 0.2-msec pulse spike; ref. 4). Temperature distributions were calculated with one-dimensional finite difference models. The calculations show that that the 0.2-msec pulse spike can cause an additional 40 C temperature fluctuation with an interaction depth of 0.08 mm near the specimen surface region. This temperature swing will be superimposed onto the temperature swing of 80 C that is induced by the 10-msec laser pulse near the 0.53-mm-deep surface interaction region.
Author
Pulse Detonation Engines; High Temperature Gases; Carbon Dioxide Lasers; Engine Tests; Gas Turbine Engines; Thermodynamic Cycles; Thermal Fatigue

20050196574 Ohio Aerospace Inst., OH, USA
High-Power Magnetoplasmadynamic Thruster Being Developed
LaPointe, Michael R.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

High-power electromagnetic thrusters have been proposed as primary in-space propulsion options for several of the bold new interplanetary and deep space missions envisioned by the Human Exploration and Development of Space (HEDS) Strategic Enterprise. As the lead center for electric propulsion, the NASA Glenn Research Center is actively involved in the design, development, and testing of high-power electromagnetic technologies to meet these demanding mission requirements. One concept of particular interest is the magnetoplasmadynamic (MPD) thruster, shown schematically in the preceding figure. In its basic form, the MPD thruster consists of a central cathode surrounded by a concentric cylindrical anode. A high-current arc is struck between the anode and cathode, which ionizes and accelerates a gas (plasma) propellant. In the self-field version of the thruster, an azimuthal magnetic field generated by the current returning through the cathode interacts with the radial discharge current flowing through the plasma to produce an axial electromagnetic body force, providing thrust. In applied field-versions of the thruster, a magnetic field coil surrounding the anode is used to provide additional radial and axial magnetic fields that can help stabilize and accelerate the plasma propellant. The following figure shows an experimental megawatt-class MPD thruster developed at Glenn. The MPD thruster is fitted inside a magnetic field coil, which in turn is mounted on a thrust stand supported by thin metal flexures. A calibrated position transducer is used to determine the force provided by the thruster as a function of thrust stand displacement. Power to the thruster is supplied by a 250-kJ capacitor bank, which provides up to 30- MW to the thruster for a period of 2 msec. This short period of time is sufficient to establish thruster performance similar to steady-state operation, and it allows a number of thruster designs to be quickly and economically evaluated. In concert with this experimental research, Glenn is also developing and using advanced numerical simulations to predict the performance of self-field and applied-field MPD thrusters.
Author
Magnetoplasmadynamic Thrusters; Interplanetary Space; Deep Space; Space Missions; Electric Propulsion

20050196577 NASA Glenn Research Center, Cleveland, OH, USA
1000 Hours of Testing Completed on 10-kW Hall Thruster
Mason, Lee S.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Between the months of April and August 2000, a 10-kW Hall effect thruster, designated T- 220, was subjected to a 1000-hr life test evaluation. Hall effect thrusters are propulsion devices that electrostatically accelerate xenon ions to produce thrust. Hall effect propulsion has been in development for many years, and low-power devices (1.35 kW) have been used in space for satellite orbit maintenance. The T-220, shown in the photo, produces sufficient thrust to enable efficient orbital transfers, saving hundreds of kilograms in propellant over conventional chemical propulsion systems. This test is the longest operation ever achieved on a high-power Hall thruster (greater than 4.5 kW) and is a key milestone leading to the use of this technology for future NASA, commercial, and military missions.
Author
Hall Thrusters; Propulsion System Configurations; Chemical Propulsion; Hall Effect; Propellants

20050196585 NASA Glenn Research Center, Cleveland, OH, USA

Numerical Propulsion System Simulation: A Common Tool for Aerospace Propulsion Being Developed

Follen, Gregory J.; Naiman, Cynthia G.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Glenn Research Center is developing an advanced multidisciplinary analysis environment for aerospace propulsion systems called the Numerical Propulsion System Simulation (NPSS). This simulation is initially being used to support aeropropulsion in the analysis and design of aircraft engines. NPSS provides increased flexibility for the user, which reduces the total development time and cost. It is currently being extended to support the Aviation Safety Program and Advanced Space Transportation. NPSS focuses on the integration of multiple disciplines such as aerodynamics, structure, and heat transfer with numerical zooming on component codes. Zooming is the coupling of analyses at various levels of detail. NPSS development includes using the Common Object Request Broker Architecture (CORBA) in the NPSS Developer's Kit to facilitate collaborative engineering. The NPSS Developer's Kit will provide the tools to develop custom components and to use the CORBA capability for zooming to higher fidelity codes, coupling to multidiscipline codes, transmitting secure data, and distributing simulations across different platforms. These powerful capabilities will extend NPSS from a zero-dimensional simulation tool to a multifidelity, multidiscipline system-level simulation tool for the full life cycle of an engine.

Derived from text

Propulsion System Configurations; Propulsion System Performance; Spacecraft Propulsion

20050196606 NASA Glenn Research Center, Cleveland, OH, USA

Assessment of Stirling Technology Has Provided Critical Data Leading Toward Flight Readiness of the Stirling Converter

Thieme, Lanny G.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Glenn Research Center is supporting the development of a Stirling converter with the Department of Energy (DOE, Germantown, Maryland) for an advanced Stirling Radioisotope Power System (SRPS) to provide spacecraft onboard electric power for NASA space science missions. A key technology assessment completed by Glenn and DOE has led to the SRPS being identified as a high-efficiency power source for such deep space missions as the Europa Orbiter and the Solar Probe. In addition, the Stirling system is now being considered for unmanned Mars rovers, especially where mission profiles may exclude the use of photovoltaic power systems, such as exploration at high Martian latitudes or for missions of long duration. The SRPS efficiency of over 20 percent will reduce the required amount of radioisotope by more than a factor of 3 in comparison to current radioisotope thermoelectric generators. This significantly reduces radioisotope cost, radiological inventory, and system cost, and it provides efficient use of scarce radioisotope resources. In support of this technology assessment, Glenn conducted a series of independent evaluations and tests to determine the technology readiness of a 55-We Stirling converter developed by Stirling Technology Company (Kennewick, Washington) and DOE. Key areas evaluated by Glenn included: 1) Radiation tolerance of materials; 2) Random vibration testing of the Stirling converter in Glenn's Structural Dynamics Lab to simulate operation in the launch environment; 3) Electromagnetic interference and compatibility (EMI/EMC) of the converter operating in Glenn's EMI lab; Independent failure modes, effects, and criticality analysis, and life and reliability 4. Independent failure modes, effects, and criticality analysis, and life and reliability assessment; and 5) SRPS cost estimate. The data from these evaluations were presented to NASA Headquarters and the Jet Propulsion Laboratory mission office by a joint industry/Government team consisting of DOE, Glenn, and Lockheed Martin Astronautics. This team concluded that there are no technical reasons that would rule out using the Stirling converter for deep space missions. As a direct result of the successful testing at Glenn, the DOE/Stirling Technology Company 55-We Stirling converter has been baselined for the SRPS. Glenn is now continuing an in-house project to assist in developing the Stirling converter for readiness for space qualification and mission implementation. As part of this effort, the Stirling converter will be further characterized under launch environment random vibration testing, methods to reduce converter EMI will be developed, and an independent performance verification will be completed. Converter life assessment and permanent magnet aging characterization tasks are also underway. Substitute organic materials for the linear alternator and piston bearing coatings for use in a high-radiation environment have been identified and have now been incorporated in Stirling converters built by Stirling Technology Company for Glenn. Electromagnetic and thermal finite element analyses for the alternator are also being conducted.

Author

Stirling Cycle; Technology Assessment; NASA Space Programs; Space Missions

20050196614 NASA Glenn Research Center, Cleveland, OH, USA

Pulse Detonation Engine Modeled

Paxson, Daniel E.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Pulse Detonation Engine Technology is currently being investigated at Glenn for both airbreathing and rocket propulsion applications. The potential for both mechanical simplicity and high efficiency due to the inherent near-constant-volume combustion process, may make Pulse Detonation Engines (PDE's) well suited for a number of mission profiles. Assessment of PDE cycles requires a simulation capability that is both fast and accurate. It should capture the essential physics of the system, yet run at speeds that allow parametric analysis. A quasi-one-dimensional, computational-fluid-dynamics-based simulation has been developed that may meet these requirements. The Euler equations of mass, momentum, and energy have been used along with a single reactive species transport equation, and submodels to account for dominant loss mechanisms (e.g., viscous losses, heat transfer, and valving) to successfully simulate PDE cycles. A high-resolution numerical integration scheme was chosen to capture the discontinuities associated with detonation, and robust boundary condition procedures were incorporated to accommodate flow reversals that may arise during a given cycle. The accompanying graphs compare experimentally measured and computed performance over a range of operating conditions for a particular PDE. Experimental data were supplied by Fred Schauer and Jeff Stutrud from the Air Force Research Laboratory at Wright-Patterson AFB and by Royce Bradley from Innovative Scientific Solutions, Inc. The left graph shows thrust and specific impulse, Isp, as functions of equivalence ratio for a PDE cycle in which the tube is completely filled with a detonable hydrogen/air mixture. The right graph shows thrust and specific impulse as functions of the fraction of the tube that is filled with a stoichiometric mixture of hydrogen and air. For both figures, the operating frequency was 16 Hz. The agreement between measured and computed values is quite good, both in terms of trend and magnitude. The error is under 10 percent everywhere except for the thrust value at an equivalence ratio of 0.8 in the left figure, where it is 14 percent. The simulation results shown were made using 200 numerical cells. Each cycle of the engine, approximately 0.06 sec, required 2.0 min of CPU time on a Sun Ultra2. The simulation is currently being used to analyze existing experiments, design new experiments, and predict performance in propulsion concepts where the PDE is a component (e.g., hybrid engines and combined cycles).

Author

Pulse Detonation Engines; Performance Prediction; Reaction Kinetics; Rocket Thrust; Specific Impulse; Heat Transfer

20050196660 NASA Glenn Research Center, Cleveland, OH, USA

Single-String Integration Test Measurements of the NEXT Ion Engine Plume

Snyder, Aaron; Kamhawi, Hani; Patterson, Michael; Britton, Melissa; June 2005; 25 pp.; In English; 40th Joint Propulsion Conference and Exhibit, 11-14 Jul. 2004, Fort Lauderdale, FL, USA

Contract(s)/Grant(s): WBS 22-800-50-01

Report No.(s): NASA/TM-2005-213196; E-14697; AIAA Paper 2004-3790; No Copyright; Avail: CASI; A03, Hardcopy

Measurements were made of a 40 cm ion-thruster plume as part of the single-string-integration-test (SSIT) activity of Phase I of the NASA's Evolutionary Xenon Thruster (NEXT) project. The NEXT ion engine incorporates design improvements that extend NSTAR power levels and efficiencies. During SSIT, an engineering model (EM2) 40 cm engine was operated using an advanced xenon propellant system in combination with either a GRC power console or advanced power processing unit. Integral goals of the single-string phase were to characterize engine performance over the full input power range and to detail thruster operation within the specification of the NEXT throttle table. Plume diagnostics measurements of relative Xe(+) and Xe(++) currents were made using near-field and far-field ExB probes. Planar geometry faraday probes were used to obtain beam current density profiles. This paper reports on the characterization of the EM2 plume over a range of SSIT operating conditions, first with the advanced propellant management system teamed with the GRC power console and then with the power-processing unit.

Author

Ion Engines; Diagnosis; Plumes; Xenon

20050196671 NASA Glenn Research Center, Cleveland, OH, USA

Solid Hydrogen Particles Analyzed for Atomic Fuels

Palaszewski, Bryan A.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Solid hydrogen particles have been selected as a means of storing atomic propellants in future launch vehicles (refs. 1 to 2). In preparation for this, hydrogen particle formation in liquid helium was tested experimentally. These experiments were conducted to visually characterize the particles and to observe their formation and molecular transformations (aging) while

in liquid helium. The particle sizes, molecular transformations, and agglomeration times were estimated from video image analyses. The experiments were conducted at the NASA Glenn Research Center in the Supplemental Multilayer Insulation Research Facility (SMIRF, ref. 3). The facility has a vacuum tank, into which the experimental setup was placed. The vacuum tank prevented heat leaks and subsequent boiloff of the liquid helium, and the supporting systems maintained the temperature and pressure of the liquid helium bath where the solid particles were created. As the operation of the apparatus was developed, the hydrogen particles were easily visualized. The figures (ref. 1) show images from the experimental runs. The first image shows the initial particle freezing, and the second image shows the particles after the small particles have agglomerated. The particles finally all clump, but stick together loosely. The solid particles tended to agglomerate within a maximum of 11 min, and the agglomerate was very weak. Because the hydrogen particles are buoyant in the helium, the agglomerate tends to compact itself into a flat pancake on the surface of the helium. This pancake agglomerate is easily broken apart by reducing the pressure above the liquid. The weak agglomerate implies that the particles can be used as a gelling agent for the liquid helium, as well as a storage medium for atomic boron, carbon, or hydrogen. The smallest particle sizes that resulted from the initial freezing experiments were about 1.8 mm. About 50 percent of the particles formed were between 1.8 to 4.6 mm in diameter. These very small particle sizes are encouraging for future formation experiments, where simpler operations will reduce the costs of production.
Author
Propellants; Solid Cryogens; Hydrogen; Fuels; Elementary Particles; Liquid Helium; Multilayer Insulation

20050196705 NASA Glenn Research Center, Cleveland, OH, USA
Validation of the NCC Code for Staged Transverse Injection and Computations for a RBCC Combustor
Ajmani, Kumud; Liu, Nan-Suey; July 2005; 36 pp.; In English
Contract(s)/Grant(s): WBS 22-714-20-22
Report No.(s): NASA/TM-2005-213647; E-15135; No Copyright; Avail: CASI; A03, Hardcopy
The NCC code was validated for a case involving staged transverse injection into Mach 2 flow behind a rearward facing step. Comparisons with experimental data and with solutions from the FPVortex code was then used to perform computations to study fuel-air mixing for the combustor of a candidate rocket based combined cycle engine geometry. Comparisons with a one-dimensional analysis and a three-dimensional code (VULCAN) were performed to assess the qualitative and quantitative performance of the NCC solver.
Author
Injection; Combustion Chambers; Backward Facing Steps

20050196823 NASA Glenn Research Center, Cleveland, OH, USA
REP Concept Feasibility Study
Edwards, Daryl A.; Ensworth, Clinton B. F.; Goodnight, Thomas W.; Sheehe, Charles J.; Wiersma, Stephen C.; Adamsen, Paul B., II; Frank, Larry; [2004]; 9 pp.; In English; 55th International Astronautical Congress, 4-8 Oct. 2004, Vancouver, Canada
Contract(s)/Grant(s): 22-972-30-07
Report No.(s): E-14845; IAC-04-IAA.3.6.P.01; Copyright; Avail: CASI; A02, Hardcopy
Radioisotope Electric Propulsion (REP) may have the potential to provide certain advantages, over conventional chemical propulsion, for outer planetary exploration involving small bodies and long term investigations for medium class missions requiring power comparable to past outer planetary exploration missions. This paper describes a study that investigates the concept s feasibility by performing a preliminary conceptual design of an REP-based spacecraft for a design reference mission. The mission utilizes a spacecraft with a radioisotope power supply less than one kilowatt while operating for a minimum of 10-years. A key element of the REP spacecraft is to ensure sustained science return by orbiting or flying in formation with selected targets. Utilizing current and impending technological advances, this study finds that at a conceptual design level a small body REP orbiter/explorer appears to be feasible for the design reference mission selected for this study.
Author
Electric Propulsion; Nuclear Electric Propulsion; Spacecraft Propulsion; Radioactive Isotopes; Feasibility Analysis; Interplanetary Spacecraft

20050198947 NASA Glenn Research Center, Cleveland, OH, USA
Photovoltaic Cell Operation on Mars
Landis, Geoffrey A.; Kerslake, Thomas; Jenkins, Phillip P.; Scheiman, David A.; [2004]; 4 pp.; In English; 19th European Photovoltaic Solar Energy Power Conference, 7-11 Jun. 2004, Paris, France
Contract(s)/Grant(s): WBS 22-759-20-01
Report No.(s): E-14870; No Copyright; Avail: CASI; A01, Hardcopy

The Martian surface environment provides peculiar challenges for the operation of solar arrays: low temperature, solar flux with a significant scattered component that varies in intensity and spectrum with the amount of suspended atmospheric dust, and the possibility of performance loss due to dust deposition on the array surface. This paper presents theoretical analyses of solar cell performance on the surface of Mars and measurements of cells under Martian conditions.
Author
Photovoltaic Cells; Spacecraft Power Supplies; Mars Roving Vehicles; Mars Environment; Operational Problems; Mars Missions

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20050188658 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Removal of Cyclohexane from a Contaminated Air Stream Using a Dense Phase Membrane Bioreactor
Roberts, Michael G.; Mar. 2005; 110 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434303; AFIT/GES/ENV/05M-03; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this research was to determine the ability of a dense phase membrane bioreactor to remove cyclohexane, a volatile organic compound in JP-8 jet fuel, from a contaminated air stream using a biologically active film for degradation. The research answered questions regarding applications of membrane bioreactors, the ability of cyclohexane to diffuse through a dense phase membrane, growth of a viable microbial culture, and determination of the performance capabilities of the reactor. To answer these questions, a literature review was conducted and laboratory experiments were performed. Through the design, construction, and testing of the dense phase membrane bioreactor used for this research, it was determined that the reactor removed cyclohexane from a contaminated air stream at an average elimination capacity of 321.4 +/- 76.2 g m-3 hr-1 with a 95% confidence interval. The successful removal of cyclohexane with the dense phase membrane bioreactor in this research effort filled a vacant niche in the scientific body of knowledge surrounding membrane bioreactor technology. Current technology applications, laboratory techniques, and data analysis are discussed.
DTIC
Air Flow; Bioreactors; Contamination; Cyclohexane; Diffusion; Flames; Jet Engine Fuels; Jet Flow; Membranes

20050188722 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Steady State Stress in a Coated Infinite Half-Space Subjected to a Moving Load
Cruthirds, Jason M.; Mar. 2005; 92 pp.; In English
Report No.(s): AD-A434400; AFIT/GCS/ENC/05-01; No Copyright; Avail: CASI; A05, Hardcopy

This research investigates the use of coatings to mitigate the stress distribution into an infinite half-space. High energy impact phenomenon at velocities exceeding the speed of sound is an important area of interest to the Air Force Research Laboratory. Holloman Air Force Base's High Speed Test Track sustains significant damage due to this phenomenon. In this thesis, the track system and coating are modeled analytically with equations of motion in terms of linear displacements. Coating thickness and material properties of epoxy or polymer laminates are investigated to understand their affect of stress distribution in the rail. An analytic solution is used to verify a finite difference method. It is found that due to limitations in coating thickness of the track system, this property has no significant affect on the stress distribution. However, the shear modulus of the material is found to have a significant affect representing the possible onset of material failure through the consideration of the combined stress field at the coating-rail interface.
DTIC
Coatings; Equations of Motion; Finite Difference Theory; Half Spaces; Loads (Forces); Steady State; Stress Waves; Stress-Strain Relationships

20050188727 Army Engineer District, Savannah, GA USA
Use of Recycled Plastics Versus Wood
Strotman, Scott; Feb. 1996; 6 pp.; In English
Report No.(s): AD-A434408; No Copyright; Avail: CASI; A02, Hardcopy

This technical note provides information on the present and potential uses of recycled plastic 'timbers' in parks and

recreation areas. Observations of direct onsite application have determined that recycled plastics are a cost-saving alternative to traditional lumber and wood products in certain applications. Two sites--Hartwell Lake and the Old Faithful Area of Yellowstone National Park--are cited here. Over the past few years, innovations in the design and construction of recycled post-consumer plastics have become a favorable way to save money and protect the environment. With the recent introduction of recycled plastic 'timbers,' this efficient application is gaining popularity as a durable, long-lasting alternative to the creosote-treated timbers and pressurized lumber used for decades. In the arena of outdoor recreation, new technologies, products, and services are resulting in better and more effective means for providing recreational facilities across the nation. Creosote-treated crossties, decking (on courtesy docks, etc.), and wooden playground facilities are being replaced at Hartwell Lake and throughout other projects in the U.S. Army Engineer District, Savannah. Although possibly less aesthetically pleasing, plastics, especially recycled plastics, are proving to be more durable and longer lasting than conventional wood products. These products typically come with up to a 50-year manufacturer warranty and are alleged to have a life expectancy equivalent to glass. Manufactured in 100-percent plastic or a mixture of 50 percent plastic-50 percent wood, these products are available in most shapes and sizes comparable to lumber. They can also be handled like lumber.
DTIC
Plastics; Wood

20050192476 National Center for Atmospheric Research, Boulder, CO, USA
TERRA/MOPITT Measurements of Tropospheric Carbon Monoxide Distributions in Support of INTEX
Edwards, D. P.; Gille, J. C.; Emmons, L. K.; Ziskin, D.; June 2005; 14 pp.; In English
Contract(s)/Grant(s): NNA05CM01G; No Copyright; Avail: CASI; A03, Hardcopy

Interaction with the ongoing satellite measurements programs was an important goal of INTEX- A. The Terra/MOPITT instrument had been making global measurements of the tropospheric carbon monoxide (CO) distribution for 4 years, and was in a unique position to provide valuable support during the field campaign. Remote sensing of CO directly addressed the scientific questions motivating the IXTEX-A strategy and deployment, and measurement of this gas was rated as being mission critical. CO is an important trace gas in tropospheric chemistry due to its role in determining the atmospheric oxidizing capacity, as an ozone precursor, and as an indicator and tracer of both natural and anthropogenic pollution arising from incomplete combustion. The satellite perspective provided the more general temporal and spatial context to the aircraft and ground-based measurements during the subsequent scientific analysis. We proposed to build on the experience of supplying MOPITT data to previous field campaigns, such as TRACE-P. We provided expedited MOPITT data processing in near real-time, along with basic analysis of the measurements to indicate, where possible, the origin of the CO plumes that impacted the regions of flight operations and other in situ measurement activities. To ensure maximum exploitation of the satellite information, we will also had a scientist in the field to present and interpret the MOPITT data for the INTEX team, and to help ensure its utility in flight planning.
Derived from text
Atmospheric Chemistry; Satellite Observation; Troposphere; Carbon Monoxide; Remote Sensing; Trace Elements

20050194601 National Inst. of Environmental Health Sciences, Research Triangle Park, NC, USA
NTP Technical Report on the Toxicology and Carcinogenesis Studies of Decalin (CAS No. 91-17-8) in F344/N Rats and B6C3F1 Mice and a Toxicology Study of Decalin in Male NBR Rats. (Inhalation Studies)
Jan. 2005; 326 pp.; In English
Report No.(s): PB2005-107379; NTP/TRP-513; No Copyright; Avail: CASI; A15, Hardcopy

Decalin is used as an industrial solvent for naphthalene, fats, resins, oils, and waxes. It is also used as a substitute for turpentine in lacquers, paints, and varnishes; as a solvent and stabilizer for shoe polishes and floor waxes; and as a constituent of motor fuels and lubricants. Other applications include use as a paint thinner and remover, a patent fuel in stoves, a high-density fuel in submarine launched cruise missile systems, and in stain removal and cleaning machinery. Decalin was nominated for study by the National Cancer Institute because of its chemical structure, its potential for consumer exposure, and a lack of adequate testing of the chemical. Male and female F344/N rats and B6C3F1 mice were exposed to decalin (greater than 99% pure) by inhalation for 2 weeks, 3 months, or 2 years. Groups of male NBR rats were exposed to decalin for 2 weeks. Male NBR rats do not produce 2u-globulin; the NBR rats were included to study the relationship of 2u-globulin and renal lesion induction. Genetic toxicology studies were conducted in Salmonella typhimurium and mouse peripheral blood erythrocytes.
NTIS
Carcinogens; Males; Mice; Rats; Respiration; Toxicology

20050194607 Battelle Memorial Inst., Columbus, OH USA

Technical Progress Report October to December 2004: Novel Concepts Research in Geologic Storage of Co(sub 2) Phase III. The Ohio River Valley Co(sub 2) Storage Project

Feb. 02, 2005; 14 pp.; In English

Report No.(s): DE2005-837075; No Copyright; Avail: Department of Energy Information Bridge

As part of the Department of Energy's (DOE) initiative on developing new technologies for storage of carbon dioxide in geologic reservoirs, Battelle has been awarded a project to investigate the feasibility of CO2 sequestration in the deep saline reservoirs in the Ohio River Valley region. This project is the Phase III of Battelle's work under the Novel Concepts in Greenhouse Gas Management grant. In addition to the DOE, the project is being sponsored by American Electric Power (AEP), BP, The Ohio Coal Development Office (OCDO) of the Ohio Department of Development, and Schlumberger. The main objective of the project is to evaluate the geology of deep formations in the Ohio River Valley region in general and in the vicinity of AEP's Mountaineer Power Plant in particular, in order to determine their potential use for conducting a long-term test of CO2 disposal in deep saline formations and potentially in nearby deep coal seams. This work supports the overall project objective of demonstrating that CO2 sequestration in deep formations is feasible from engineering and economic perspectives, as well as being an inherently safe practice and one that will be acceptable to the public. The current technical progress report summarizes activities completed for the October through December 2004 period of the project. As discussed in the report, the technical activities focused on initial injection well design, completion of the site characterization report, assessment of monitoring technologies, shipment of coal samples for testing the capture system to Mitsubishi Heavy Industry, and presentation of project progress at several venues. In addition, proposals to DOE for continued funding of the project activities under the current contract and potentially a new contract for development of regional framework were being evaluated and processed.

NTIS

Carbon Dioxide; Geology; Reservoirs; Rivers; Valleys

20050194620 Fluor Federal Services, Richland, WA, USA

Implementing Heat-Sealed Bag Refief and Hydrogen/Methane Testing to Reduce the Need to Repack Hanford Transuranic Waste

McDonald, K. M.; Jan. 2005; 16 pp.; In English

Report No.(s): DE2005-836355; HNF-23784; No Copyright; Avail: Department of Energy Information Bridge

The Department of Energy's site at Hanford has a significant quantity of drums containing heat-sealed bags that required repackaging under previous revisions of the TRUPACT-II Authorized Methods for Payload Control (TRAMPAC) before being shipped to the Waste Isolation Pilot Plant (WIPP). Since glovebox repackaging is the most rate-limiting and resource-intensive step for accelerating Hanford waste certification, a cooperative effort between Hanford's TRU Program and the WIPP site significantly reduced the number of drums requiring repackaging. More specifically, recent changes to the TRAMPAC (Revision 19C), allow relief for heat-sealed bags having more than 390 square inches of surface area. This relief is based on data provided by Hanford on typical Hanford heat-sealed bags, but can be applied to other sites generating transuranic waste that have waste packaged in heat-sealed bags. The paper provides data on the number of drums affected, the attendant cost savings, and the time saved. Hanford also has a significant quantity of high-gram drums with multiple layers of confinement including heat-scaled bags. These higher-gram drums are unlikely to meet the decay-heat limits required for analytical category certification under the TRAMPAC. The combination of high-gram drums and accelerated reprocessing/shipping make it even more difficult to meet the decay-heat limits because of necessary aging requirements associated with matrix depletion. Hydrogen/methane sampling of headspace gases can be used to certify waste that does not meet decay-heat limits of the more restrictive analytical category using the test category. The number of drums that can be qualified using the test category is maximized by assuring that the detection limit for hydrogen and methane is as low as possible. Sites desiring to ship higher-gram drums must understand the advantages of using hydrogen/methane sampling and shipping under the test category. Headspace gas sampling, as specified by the WIPP Waste Analysis Plan, provides the sample necessary for hydrogen/methane analysis. Most Hanford drums are not equipped with a filter through which a headspace gas sample can be obtained. A pneumatic system is now used to insert 'dart' filters. The filters were developed by the vendor and approved for WIPP certification at the request of the Hanford Site. The same pneumatic system is used to install septum-type sample ports to allow the headspace to be sampled. Together, these steps allow the Hanford Site to avoid repackaging a large percentage of drums, and thus accelerate certification of waste destined for WIPP.

NTIS

Bags; Hydrogen; Methane; Heat Shielding; Test Equipment; Waste Heat

20050194624 Japan Atomic Energy Research Inst., Ibaraki, Japan
Automatic Measurement of Low Level Contamination on Concrete Surfaces
Tachibana, M.; Itoh, H.; January 2002; 12 pp.; In English
Report No.(s): DE2005-827794; No Copyright; Avail: Department of Energy Information Bridge

Automatic measurement of radioactivity is necessary for considering cost effectiveness in final radiological survey of building structures in decommissioning nuclear facilities. The RAPID (radiation measuring pilot device for surface contamination) was developed to be applied to automatic measurement of low level contamination on concrete surfaces. The RAPID has a capability to measure contamination with detection limit of 0.14 Bq/ sq cm for Co-60 in 30 seconds of measurement time and its efficiency is evaluated to be 5 sq m/h in a normal measurement option. It was confirmed that low level contamination on concrete surfaces could be surveyed by the RAPID efficiently compared with direct measurement by workers through its actual application.
NTIS
Concretes; Radiation Measuring Instruments; Radioactive Wastes; Waste Management; Contamination; Automatic Control

20050194628 Tulane Univ., New Orleans, LA, USA
Preparation and Catalytic Applications of Silica. Final Report, November 11, 1985-October 30, 2002
Gonzales, R.; Dec. 1985; 12 pp.; In English
Report No.(s): DE2005-823847; No Copyright; Avail: Department of Energy Information Bridge

This final report covers the entire period from its inception in 11/01/1985 through the final funding period, 10/30/2002. The grant was initiated when the PI was on the Faculty in the Department of Chemical Engineering at the University of Illinois at Chicago and continued without interruption when he moved to Tulane University in August 1990. The designation number on the award may have changed as a result of a shift from Argonne National Laboratory to Oak Ridge and then back to Argonne.
NTIS
Silicon Dioxide; Surface Reactions

20050194631 Bettis Atomic Power Lab., West Mifflin, PA, USA
Application of a Sixth Order Generalized Stress Function To Determine Limit Loads for Plates with Triangular Penetration Patterns
Gordon, J. L.; Jones, D. P.; January 2005; 16 pp.; In English
Report No.(s): DE2005-835045; B-T-3396; No Copyright; Avail: Department of Energy Information Bridge

This paper investigates the use of a sixth order function to represent the collapse surface for improved accuracy of the inplane response. Explicit elastic-perfectly plastic finite element solutions are obtained for unit cells representing an infinite array of circular penetrations arranged in an equilateral triangular array. These cells are used to create a numerical representation of the complete collapse surfaces for a number of ligament efficiencies (h/P where h is the minimum ligament width and P is the distance between hole centers). Each collapse surface is then fit to a sixth order function that satisfies the periodicity of the hole pattern. Sixth-order collapse functions were developed for h/P values between .05 and .50. Accuracy of the sixth order and the fourth order functions are compared. It was found that the sixth order function is indeed more accurate, reducing the error from 12.2% for the fourth order function to less than 3% for the sixth order function.
NTIS
Loads (Forces); Penetration; Stress Analysis; Stress Functions

20050194633 Louisiana State Univ., Baton Rouge, LA USA
S and T Accomplishment Report
Aug. 19, 2003; 18 pp.; In English
Report No.(s): DE2005-823534; No Copyright; Avail: Department of Energy Information Bridge

Within the framework of a DOE National Laboratory/EPSCoR state partnership, investigations by researchers at Louisiana State University and Oak Ridge National Laboratory were focused on revealing the unique nanophase properties of alloy thin-films and bimetallic surfaces. Employing a number of experimental preparation techniques and characterization probes (synchrotron-based angle-resolved and valence/core-level PES and variable-temperature STM/STS), the goal of this program was to elucidate of the interconnecting physical and chemical properties of a variety of alloy surfaces and thin-films,

specifically, determining the correlation between atomic structure/composition, electronic structure, and catalytic/chemisorption properties of these nanoscale.
NTIS
Bimetals; Alloys; Thin Films; Surface Energy

20050194713 Department of Energy, Washington, DC USA
Theory of High Frequency Rectifxcation by Silicon Crystals
Oct. 29, 1942; 22 pp.; In English
Report No.(s): DE2005-4415436; No Copyright; Avail: Department of Energy Information Bridge

The excellent performance of British 'red dot' crystals is explained as due to the knife edge contact against a polished surface. High frequency rectification depends critically on the capacity of the rectifying boundary layer of the crystal. C. For high conversion efficiency, the product of this capacity and of the 'forward' (bulk) resistance R(sub b) of the crystal must be small. For a knife edge, this product depends primarily on the breadth of the knife edge and very little upon its length. The contact can therefore have a rather large area which prevents burn-out. For a wavelength of 10 cm. the computations show that the breadth of the knife edge should be less than about 10(sup -3) cm. For a point contact the radius must be less than 1.5 x 10(sup -3) cm. and the resulting small area is conductive to burn-out. The effect of 'tapping' is probably to reduce the area of contact.
NTIS
Crystals; High Frequencies; Rectification; Silicon

20050195930 FN Mfg., Inc., Columbia, SC USA
Barrel Weight Reduction
Livermore, Greg; Sadowski, Lucian; May 2005; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAE30-03-C-1129
Report No.(s): AD-A434693; ARDEC/ARAET-TR-05005; No Copyright; Avail: CASI; A03, Hardcopy

The soldier on the battlefield carriers a lot of equipment into combat. The weapon weight is a burden to our soldiers. Using the MK46 barrel as a baseline and implementing the use of a full Stellite liner and state-of-the-art UltraCem nickel-boride coating, the weight can be reduced. This report describes the design process, the finite element analysis, thermal and modal analysis, the design, function, and testing of these barrels.
DTIC
Borides; Coatings; Guns (Ordnance); Linings; Nickel; Weight Reduction

20050195992 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Co-Expression of Regulator of G Protein Signaling 4 (RGS4) and the MU opioid Receptor in Regions of Rat Brain: Evidence That RGS4 Attenuates MU Opioid Receptor Signaling
Crowder, A. T.; Jan. 2003; 161 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434787; No Copyright; Avail: Defense Technical Information Center (DTIC)

Regulators of G protein Signaling (RGS) proteins influence G protein-coupled receptor signal transduction by enhancing the intrinsic GTPase activity of G proteins. The RGS-enhanced GTPase activity of G proteins may be responsible for the desensitization of certain G protein-coupled receptors, including the mu opioid receptor. The goal of this research was to evaluate the ability of recombinant RGS4 to affect mu opioid receptor-mediated cellular signaling and to identify regions of the rat brain in which both RGS4 and the mu opioid receptor are co-expressed. We evaluated the ability of recombinant RGS4 to affect D-Ala2, N-Me-Phe4, glyol enkephalin (DAMGO)-mediated inhibition of adenylyl cyclase activity in membranes of SH-SY5Y cells, a cell line that express endogenous mu receptors. Recombinant RGS4 caused a concentration-dependent attenuation of DAMGOmediated inhibition of adenylyl cyclase activity. RGS4 diminished the efficacy, but not the potency, of DAMGO in inhibiting adenylyl cyclase activity. In contrast, RGS4 had no effect on the ability of GTPgS, a nonhydrolyzable analogue of GTP, to inhibit adenylyl cyclase activity. RGS4 also had no effect on DAMGO stimulated 35SgtpgS binding in SH-SY5Y membranes. Additionally, RGS4 was tested for its ability to affect 3Hdamgo binding to the mu receptor. RGS4 failed to affect either the KD of the Bmax of 3Hdamgo in saturation binding experiments. Antibodies generated against rat RGS4 and the rat mu opioid receptor were used in immunohistochemical staining to identify specific regions of rat brain where the two proteins are co-expressed. Both RGS4 and mu opioid receptor proteins were present in many of the same regions of the brain. Further, we demonstrated that RGS4 is primarily localized to the nucleus, but that administration of fentanyl, a

potent mu opioid agonist, induces translocation out of the nucleus, to the cytoplasm in the hippocampal CA# pyramidal neurons.
DTIC
Proteins; Rats; Regulators

20050196062 Army Engineer Research and Development Center, Vicksburg, MS USA
Soil Phosphorus Compositional Characteristics as a Function of Land-Use Practice in the Upper Eau Galle River Watershed, Wisconsin
James, William F.; Eakin, Harry L.; Ruiz, Carlos E.; Barko, John W.; Sep. 2004; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434894; ERDC/TN SMART-04-5; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this research was to quantify biologically labile and refractory phosphorus species in source soils of an agricultural watershed that drains into a eutrophic Corps of Engineers reservoir. Eutrophication of receiving waters is strongly linked to the erosion and transport of particulate and soluble nutrients derived from the watershed landscape. In dairy and agricultural settings, amendment of soils with fertilizers and manure is usually based on crop nitrogen (N) requirements rather than phosphorus (P) to obtain optimal yield. In particular, various manures also have a high P content; usually well in excess of crop uptake requirements with N:P ratios near 1 (Powers and Van Horn 1998). Thus, applications based on crop N requirements usually result in the buildup of soil P levels to excessive concentrations that can be transported to receiving waters during storms (Sharpley et al. 1994).
DTIC
Eutrophication; Land Use; Phosphorus; Rivers; Soils; Watersheds

20050196092 Operational Technologies Corp., Beavercreek, OH USA
Analysis of Algorithms Predicting Blood: Air and Tissue: Blood Partition Coefficient from Solvent Partition Coefficients for Use in Complex Mixture Physiological Based Pharmacokinetic/Pharmacodynamic Modeling
Sterner, Teresa R.; Robinson, Peter J.; Mattie, David R.; Burton, G. A.; Mar. 2004; 79 pp.; In English
Contract(s)/Grant(s): F33615-00-C-6060; Proj-1710
Report No.(s): AD-A434945; AFRL-HE-WP-TR-2004-0032; No Copyright; Avail: CASI; A05, Hardcopy

Algorithms predicting tissue and blood partition coefficients (PCs) from solvent properties (octanol:water, saline or water:air, oil:air coefficients) were compared to assess their usefulness for a petroleum mixtures physiologically based pharmacokinetic/pharmacodynamic model. Measured blood:air and tissue:blood PCs were sought from literature resources for 14 JP-8 components. PCs, mainly from vial equilibration experiments, were separated by species (rat and human) and averaged by tissue and chemical. Average experimental PCs were then compared with predicted PCs calculated using algorithms from nine published sources. The algorithms chosen use solvent PCs due to the relative accessibility of these parameters. Tissue:blood PCs were calculated from ratios of predicted tissue:air and experimental blood:air values (PCEB). Calculated PCs were evaluated using percent error compared to the experimental value. Of the 231 calculated values, 29% performed within +/- 20% of the experimental PC values. Algorithms were divided into three main types. Empirical equations (derived from linear regression of experimental PC data), physiologically based equations (based on water and lipid components of a tissue type), and hybrid equations (physiological parameters and empirical factors combined) each performed equally well. PCEs values were compared with tissue:blood PCs calculated from ratios of predicted tissue:air and predicted blood:air values (PC(sub pb). Overall, 68% of PCER values had smaller absolute percent errors than PC(sub pb) values. Physiological equations should not be used to calculate PC(sub pb) values as 100% of these PCps values had higher absolute percent errors than corresponding PC(sub eb) values. If calculated PC values must be used in models, a comparison of experimental and predicted PCs for chemically similar compounds is advisable, so one understands the expected error level in calculated values.
DTIC
Algorithms; Aqueous Solutions; Blood; Chemical Analysis; Chemical Properties; Coefficients; Models; Pharmacology; Physiology; Predictions; Solvents

20050196098 Army Research Lab., Aberdeen Proving Ground, MD USA
Fatty Acid-Based Monomers as Styrene Replacements for Liquid Molding Resins
La Scala, John J.; Sands, James M.; Orlicki, Joshua A.; Palmese, Giuseppe R.; Robinette, E. J.; May 2005; 16 pp.; In English
Report No.(s): AD-A434951; ARL-RP-94; No Copyright; Avail: Defense Technical Information Center (DTIC)

One method of reducing styrene emissions from vinyl ester (VE) and unsaturated polyester resins (UPE) is to replace some or all of the styrene with fatty acid-based monomers. Methacrylated fatty acid (MFA) monomers are ideal candidates because they are inexpensive, have low volatilities, and free-radically polymerize with vinyl ester. The viscosity of VE resins using these fatty acid monomers ranged from 700 2000 cP, which is considerably higher than that of VE/styrene resins (^100 cP). In addition, the Tg of VE/MFA polymers were only on the order of 80 C, which is significantly lower than that of VE/styrene polymers. Decreasing the length of the base fatty acid chains from 18 to 12 carbon atoms improved the Tg by 20 C, while lowing the resin viscosity from ^2500 to ^1000 cP. Residual unsaturation sites on the fatty acid backbone decreased the cure rate of the resins thereby decreasing polymer properties. Ternary blends of VE, styrene, and fatty acid monomers also effectively improved the flexural, fracture, and thermo-mechanical properties and reduced the resin viscosity to acceptable levels, while using less than 15 wt% styrene, far less than commercial VE resins.
DTIC
Casting; Fatty Acids; Monomers; Resins; Styrenes

20050196123 Iowa State Univ. of Science and Technology, Ames, IA USA
Triazolium-based Energetic Ionic Liquids
Schmidt, Michael W.; Gordon, Mark S.; Boatz, Jerry A.; Mar. 2005; 30 pp.; In English
Contract(s)/Grant(s): Proj-2303
Report No.(s): AD-A434989; No Copyright; Avail: Defense Technical Information Center (DTIC)
The energetic ionic liquids formed by the 1,2,4-triazolium cation family and dinitramide anion are investigated by ab initio quantum chemistry calculations, to address the following questions: How does substitution at the triazolium ring's nitrogen atoms affect its heat of formation, and its charge delocalization? What kind of ion dimer structures might exist? And, do deprotonation reactions occur, as a possible first step in the decomposition of these materials?
DTIC
Ions; Liquids; Nitrogen; Quantum Chemistry

20050196542 Battelle Pacific Northwest Labs., Richland, WA USA
Electro-Spark Deposited Coatings for Replacement of Chrome Electroplating
Johnson, R. N.; Bailey, J. A.; Jun. 2005; 55 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-SERDP-PP-1147
Report No.(s): AD-A434852; ARAET-CR-05002; No Copyright; Avail: CASI; A04, Hardcopy
Electro-spark deposited (ESD) coating processes were investigated for line-of-sight (LOS) and non-line-of-sight (NLOS) applications under this Strategic Environmental Research and Development Program Task PP-1147. Apparatus necessary for NLOS ESD applications were developed by Pacific Northwest National Laboratories. Fatigue debits due to application of ESD coatings on reduced section specimens were investigated. A follow-on Environmental Science and Technology Certification Program task resulted from this work and ESD has now been used and is now available for use at Anniston Army Depot, but so far only for LOS applications.
DTIC
Chromium; Coatings; Electrodeposition; Electroplating; Plating; Replacing; Sparks

20050196735 Northwestern Univ., Evanston, IL, USA
Solid State, Surface and Catalytic Studies of Oxides
Nov. 2004; 24 pp.; In English
Report No.(s): DE2005-836091; No Copyright; Avail: Department of Energy Information Bridge
This project investigates the catalytic properties of oxides for the selective oxidative dehydrogenation of light alkanes and for hydrocarbon reduction of NO(sub x). Various vanadium oxide based catalysts were investigated to elucidate the relationship between the chemical and structural properties of the catalysts and their selectivity for the formation of alkenes. It was found that vanadium oxide units that are less reducible give higher selectivities. For hydrocarbon reduction of NO(sub x), it was found that alumina-based catalysts can be effective at higher temperatures than the corresponding zeolite-based catalysts. On some catalysts, such as SnO(sub 2)/Al(sub 2)O(sub 3). Ag/Al(sub 2)O(sub 3), the alumina participates directly in the reaction, making the catalyst bifunctional. These results are useful in research to improve the performance of this stress of catalysts.
NTIS
Alkanes; Catalysts; Dehydrogenation; Nitrogen Oxides; Oxides; Solid State; Aluminum Oxides

20050196768 North Carolina State Univ., Raleigh, NC, USA
Dermal Absorption of Cutting Fluid Mixtures
Baynes, R. E.; Riviere, J. E.; Monteiro-Riviere, N.; Smith, C.; January 2005; 42 pp.; In English
Contract(s)/Grant(s): R01-OH-003669
Report No.(s): PB2005-107482; No Copyright; Avail: CASI; A03, Hardcopy

This work has focused on understanding how cutting fluid additives, contaminants, and metal-working cleanser can influence the dermal disposition of potential skin irritants. Representatives of three commonly used classes of additives (emulsifier, lubricant, and biocide) were investigated in this study. The three representative additives, linear alkylbenzene sulfonate (LAS), sulfate ricinoleic acid (RA), and triazine, were used in the initial phases of this research answer these questions. Diffusion of these additives across skin and inert membranes was determined experimentally to help identify physicochemical and chemical-biological interactions when workers are exposed to similar complex cutting fluid formulations. Because triazine was shown to be more readily absorbed across skin, it was used as a chemical marker to further assess contaminant and cleanser effects on dermal absorption.
NTIS
Cutting; Lubricants; Skin (Anatomy); Toxicity

20050196771 Gyeongsang National Univ., Chinju, Korea, Republic of
Preparation of Metal Filter Element for Fail Safety in IGCC Filter Unit
January 2005; 12 pp.; In English
Report No.(s): DE2005-835840; No Copyright; Avail: Department of Energy Information Bridge

Metal filter elements as the fail safety filter are fabricated by the methods using cold isostatic pressure (compress method) and binder (binder method) to form the filter element and tested in experimental and bench units. The fail safety filter on the filtration system is mounted additionally in order to intercept the particle leak when the main filter element is broken. So it should have two contrary functions of a high permeability and being plugged easily. The filter element having high porosity and high plugging property was fabricated by the bind method. It has the porosity more than 50%, showed very small pressure drop less than 10mmH2O at the face velocity of 0.15m/s, and plugged within 5 minutes with the inhibition of the particle leak larger than 4 (micro)m. The test result of corrosion tendency in IGCC gas stream at 500 C shows SUS310L material is very reasonable among SUS310, SUS316, Inconel 600, and Hastelloy X.
NTIS
Cycles; Failure; Gasification; Safety

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COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20050188564 Aerospace Corp., El Segundo, CA USA
Using Composites in Seismic Retrofit Applications
Karbhari, V. M.; Apr. 2005; 201 pp.; In English
Report No.(s): AD-A434114; ATR-2005(7796)-2; No Copyright; Avail: CASI; A10, Hardcopy

This report was prepared to provide a comprehensive review of the state-of-the-art for using composite materials for seismic retrofit applications. The emphasis is on seismic retrofit of reinforced concrete columns. The report is presented in eleven chapters. Chapters 1-3 provide a basic introduction to composite materials, including discussions on the types of matrix and reinforcement materials, processing methods, and basic mechanics. Polymer matrix composites with continuous carbon or glass fibers as reinforcement are emphasized since they are the most frequently used composite materials for seismic retrofit applications. Chapters 4-6 review methods for designing and applying composite jackets onto columns and performing structural tests on columns with composite jackets. Environmental durability test protocols and data for composite systems for seismic retrofit are reviewed in Chapters 7-10. Examples of commercially available composite retrofit systems are presented in Chapter 11.
DTIC
Composite Materials; Glass Fibers; Matrix Materials; Polymers; Retrofitting; Seismic Waves

20050192552 Akron Univ., Akron, OH, USA
Polyimide/carbon Nanocomposites
Harris, Frank W.; June 30, 2003; 25 pp.; In English
Contract(s)/Grant(s): NAG1-02035; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this product is to design and characterize well-defined conductive nanocomposite materials. The materials will be composed of a polymer matrix composed of rigid-backbone polyimides, and will be filled with modified or unmodified multi-walled carbon nanotubes (MWNTs). The ultimate design of this project is to create composite materials with optical clarity and a high conductivity.
Author
Carbon Nanotubes; Nanocomposites; Polyimides; Polymers; Nanofabrication

20050192645 NASA Glenn Research Center, Cleveland, OH, USA
Colloidal Gelation-2 and Colloidal Disorder-Order Transition-2 Investigations Conducted on STS-95
Hoffmann, Monica T.; Research and Technology 1999; March 2000; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Colloidal Gelation-2 (CGEL 2) and Colloidal Disorder-Order Transition-2 (CDOT 2) investigations flew on Space Shuttle Discovery mission STS-95 (also known as the John Glenn Mission). These investigations were part of a series of colloid experiments designed to help scientists answer fundamental science questions and reduce the trial and error involved in developing new and better materials. Industries dealing with semiconductors, electro-optics, ceramics, and composites are just a few that may benefit from this knowledge. The goal of the CGEL 2 investigation was to study the fundamental properties of colloids to help scientists better understand their nature and make them more useful for technology. Colloids consist of very small (submicron) particles suspended in a fluid. They play a critical role in the technology of this country, finding uses in materials ranging from paints and coatings to drugs, cosmetics, food, and drink. Although these products are routinely produced and used, there are still many aspects of their behavior about which scientists know little. Understanding their structures may allow scientists to manipulate the physical properties of colloids (a process called 'colloidal engineering') to produce new materials and products. Colloid research may even improve the processing of known products to enhance their desirable properties.
Derived from text
Colloids; Discovery (Orbiter); Colloiding; Space Transportation System

20050195871 NASA Glenn Research Center, Cleveland, OH, USA
Boiling on Microconfigured Composite Surfaces Enhanced
Chao, David F.; Research and Technology 1999; March 2000; 3 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Boiling heat transfer is one of the key technologies for the two-phase active thermal-control system used on space platforms, as well as for the dynamic power systems aboard the International Space Station. Because it is an effective heat transfer mode, boiling is integral to many space applications, such as heat exchangers and other cooling devices. Nucleate boiling near the critical heat flux (CHF) can transport very large thermal loads with a much smaller device and much lower pumping power than for single-phase heat exchangers. However, boiling performance sharply deteriorates in a reduced-gravity environment, and operation in the CHF regime is somewhat perilous because of the risk of burnout to the device surface. New materials called microconfigured metal-graphite composites can enhance boiling. The photomicrograph shows the microconfiguration (x3000) of the copper-graphite (Cu-Gr) surface as viewed by scanning electronic microscope. The graphite fiber tips appear as plateaus with rugged surfaces embedded in the copper matrix. It has been experimentally demonstrated that this type of material manifests excellent boiling heat transfer performance characteristics and an increased CHF. Nonisothermal surfaces were less sensitive to variations of wall superheat in the CHF regime. Because of the great difference in conductivity between the copper base and the graphite fiber, the composite surfaces have a nonisothermal surface characteristic and, therefore, will have a much larger 'safe' operating region in the CHF regime. In addition, the thermocapillary forces induced by the temperature differences between the fiber tips and the metal matrix play an important role in bubble detachment, and may not be adversely affected in a reduced-gravity environment. All these factors indicate that microconfigured composites may improve the reliability and economy (dominant factors in all space applications) of various thermal components found on spacecraft during future missions.
Author
Nucleate Boiling; Heat Transfer; Metal Matrix Composites; Microstructure; Surface Reactions; Graphite; Copper; Aluminum Graphite Composites

20050195878 NASA Glenn Research Center, Cleveland, OH, USA

High-Flow PMR-Polymide Composites Developed With Mechanical Properties Comparable to Other High-Temperature Systems

Meador, Michael A.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

PMR polyimides, in particular PMR-15, are well known for their excellent high-temperature stability and performance, and solvent resistance. However, the processing of these materials is limited, for the most part, to prepreg-based methods, such as compression or autoclave processing. These methods involve substantial amounts of hand labor, and as a result, manufacturing costs for components made from PMR polyimides can be high. In cost-sensitive applications, these high manufacturing costs can make the use of PMR polyimide-based components cost prohibitive. Lower cost manufacturing methods, such as resin transfer molding (RTM) and resin film infusion, have been demonstrated to reduce manufacturing costs by as much as 50 percent over prepreg-based methods. However, these processes are only amenable to materials with melt viscosities below 30 poise. Most PMR polyimides have melt viscosities on the order of 100 poise or higher. Recent efforts at the NASA Glenn Research Center have focused on chemical modifications to PMR polyimides to reduce their melt viscosity to the point where they could be processed by these low-cost manufacturing methods without adversely affecting their high-temperature properties and performance. These efforts have led to a new family of PMR polyimides that have melt viscosities significantly lower than that of PMR-15. Reductions in melt viscosity are brought about through the introduction of molecular twists in the polymer backbone. Carbon fiber (T650- 35) composites were prepared from one of these polyimides, designated PMR-Flex, by compression molding. The properties of these composites are presented below and compared with comparable composites made from PMR-15 and PETI-RTM, a new low-melt-viscosity polyimide.

Author

Polyimides; High Temperature; Carbon Fibers; Fiber Composites; Stability; Resin Film Infusion

20050196064 Naval Surface Warfare Center, Bethesda, MD USA

Design Equations and Criteria of Orthotropic Composite Panels

Jones, Brian J.; Jun. 2004; 46 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434896; NSWCCD-65-TR-2004/16; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Navy is currently pursuing lightweight material options for shipboard structural applications, including hull, topside and mast structures. It is necessary to develop preliminary design criteria and methods to assess structures before the development of detailed finite element models. The design equation and criteria presented in this report are for simply-supported orthotropic plate typically used in composite ship structures. The design equations presented provide orthotropic plate solutions for principal use in code development. In addition, the method could extend to overall ship structural design, for scanting design, or for input into an overall design program. This document provides design equations and criteria for simply-supported orthotropic plates in the context of the design of composite hull and topside structures. It identifies ship structural loads, structural design criteria, and design equations for solid, sandwich and hat-stiffened panels, as well as girders and frames.

DTIC

Composite Materials; Composite Structures; Design Analysis; Panels; Ships; Structural Design

20050196102 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Fatigue Behavior of a Functionally-Graded Titanium Matrix Composite

Cunningham, Scott R.; Mar. 2005; 111 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434957; AFIT/GAE/ENY/05-M06; No Copyright; Avail: Defense Technical Information Center (DTIC)

Functionally-graded Titanium Matrix Composites are an attempt to utilize the high-strength properties of a titanium matrix composite with a monolithic alloy having the more practical machining qualities. This work studied the mechanical characteristics of the joint region as a first step toward future evaluation of this material. The scope of this effort involved testing under monotonic tension and fatigue loading conditions. Mechanical properties and cyclic behavior were evaluated for the joint area and then compared to those of the parent materials. The results of this study found that the strength of the transition region was slightly higher than the unreinforced alloy. However, the presence of fiber ends in the transition region proved to be the source of failure under fatigue loading conditions. Failure in the transition region did not occur at the tip of the taper joint as anticipated. Instead, failure occurred at the transition to the next ply in the taper. This indicates that fiber volume, in conjunction with the presence of fiber ends, plays a key role in the fatigue life of the entire material. These findings

encourage and provide the basic scientific knowledge for further evaluation and development of functionally-graded titanium matrix composites.
DTIC
Matrix Materials; Metal Matrix Composites; Titanium

20050196129 Air Force Research Lab., Edwards AFB, CA USA
Microstructural Studies of In-Situ Mesophase Transformation in the Fabrication of Carbon-Carbon Composites
Chioujones, K. M.; Ho, W.; Fathollahi, B.; Chau, P. C.; Wapner, P. G.; Hoffman, W. P.; Mar. 2005; 15 pp.; In English
Contract(s)/Grant(s): Proj-2306
Report No.(s): AD-A435002; No Copyright; Avail: Defense Technical Information Center (DTIC)

Injection of a low viscosity, fully transformed mesophase pitch into a fiber preform can be an effective approach to fabrication of advanced, high-performance carbon-carbon (C/C) composites 1. Here, flow-induced microstructures can be stabilized by oxidation such that upon carbonization, the fibrous carbon needles running through the flow channels are retained. Using the injection and stabilization process, one can raise the density of C/C composites to reasonably high levels in a couple of cycles. While the injection method is effective in making highly densified materials with controlled microstructure, it is not without constraints. This method is best applied to uniform geometries such as aircraft brakes, and the use of rigidized preforms is required to resist compaction under injection pressure. Severe injection conditions with diminishing return in density gain could be encountered if the process has to be carried beyond two to three cycles.
DTIC
Carbon-Carbon Composites; Fabrication; Microstructure

20050196557 NASA Glenn Research Center, Cleveland, OH, USA
Long-Term Durability of a Matrix for High-Temperature Composites Predicted
Bowles, Kenneth J.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Polymer matrix composites (PMC's) are being increasingly used in applications where they are exposed for long durations to harsh environments such as elevated temperatures, moisture, oils and solvents, and thermal cycling. The exposure to these environments leads to the degradation of structures made from these materials. This also affects the useful lifetimes of these structures. Some of the more prominent aerospace applications of polymer matrix composites include engine supports and cowlings, reusable launch vehicle parts, radomes, thrust-vectoring flaps, and the thermal insulation of rocket motors. This demand has led to efforts to develop lightweight, high-strength, high-modulus materials that have upper-use temperatures over 316 C. A cooperative program involving two grants to the Massachusetts Institute of Technology and in-house work at the NASA Glenn Research Center was conducted to identify the mechanisms and the measurement of mechanical and physical properties that are necessary to formulate a mechanism-based model for predicting the lifetime of high-temperature polymer matrix composites. The polymer that was studied was PMR-15 polyimide, a leading matrix resin for use in high-temperature-resistant aerospace composite structures such as propulsion systems. The temperature range that was studied was from 125 to 316 C. The diffusion behavior of PMR-15 neat resin was characterized and modeled. Thermogravimetric analysis (TGA) was also conducted in nitrogen, oxygen, and air to provide quantitative information on thermal and oxidative degradation reactions. A new low-cost technique was developed to collect chemical degradation data for isothermal tests lasting up to 4000 hr in duration. In the temperature range studied, results indicate complex behavior that was not observed by previous TGA tests, including the presence of weight-gain reactions. These were found to be significant in the initial periods of aging from 125 to 225 C. Two types of weight loss reactions dominated at aging temperatures above 225 C. One was concentrated at the surface of the polymer and was very active at temperatures above 225 C. The second was observed to dominate in the latter stages of aging at temperatures below 260 C. This three-reaction model satisfactorily explains past findings that the degradation mechanism of PMR-15 appears to change around 316 C. It also indicates that the second weight gain mechanism is a significant factor at temperatures below 204 C. On the basis of these results, a predictive model was developed for the thermal degradation of PMR-15 at 316 C. A comparison of data generated by this model with actual experimental data is shown in the following figure.
Author
Polymer Matrix Composites; High Temperature; Composite Structures; Aircraft Structures; Cowlings; Thermal Degradation; Thrust Vector Control

20050196561 NASA Glenn Research Center, Cleveland, OH, USA

Creep/Rupture Behavior of Melt-Infiltrated SiC/SiC Composites Being Investigated

Hurst, Janet B.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The failure behavior of melt-infiltrated SiC/SiC ceramic matrix composites is under investigation at the NASA Glenn Research Center as part of NASA's Ultra-Efficient Engine Technology Program. This material was originally developed under the High Speed Research Office's Enabling Propulsion Materials Program. Creep and rupture data provide accelerated testing information to predict material behavior under engine use situations (1500 to 2400 F). This information gives insights into various material development paths to improve composites as well as improve understanding of failure mechanisms. The left figure shows the fracture surface of a CMC material following over 200 hr of testing at 2400 F. This surface demonstrates the kind of fibrous pullout desirable for maximum crack deflection, hence non-brittle failure. Microscopy suggests that creep and rupture of these materials can best be considered as a probabilistic property, rather than a material property. Fiber failure occurs first in isolated regions, while stronger adjacent fibers remain intact. The right figure shows a region where oxide deposits blur and round the fiber images. Because the oxidation kinetics of SiC are well understood, this oxide scale can be used as a measure of the length of time various regions of the composites have been exposed to the environment, hence providing vital information regarding the sequence of failure. The oxide scale in the right figure indicates an early failure of this tow of fibers, whereas adjacent tows remain oxide free, suggesting failure much later in time. The path of various cracks can be followed throughout the composite in this manner, suggesting failure mechanisms.

Author

Ceramic Matrix Composites; Creep Properties; Fracturing; Reaction Kinetics; Accelerated Life Tests; Cracks

20050196562 DYNACS Engineering Co., Inc., USA

Environment-Conscious Ceramics (Ecoceramics)

Singh, Mrityunjay; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Since the dawn of human civilization, there has always been a delicate balance between expanding human frontiers and coexisting with the ecosystem. In the new millennium, it will be extremely important to develop various materials, products, and processes to sustain a healthy life in harmony with nature that allow us to minimize any harmful effects. Environment-conscious ceramics (ecoceramics) are a new class of materials that can be produced with renewable resources (wood) and wood wastes (wood sawdust). Wood is one of the best and most intricate engineering materials created by nature. Natural woods of various types are available throughout the world. In addition, wood sawdusts are generated in abundant quantities by sawmills. Environment-conscious ceramic materials, fabricated via the pyrolysis and infiltration of natural wood-derived preforms with silicon have tailorable properties with numerous potential applications.

Derived from text

Ceramics; Wood; Composite Materials

20050196564 NASA Glenn Research Center, Cleveland, OH, USA

Cooled Ceramic Matrix Composite Panel Successfully Tested in Rocket Exhaust

Eckel, Andrew J.; Research and Technology 2000; March 2001; 1 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Actively cooled ceramic matrix composite (CMC) components are enabling or enhancing for a broad range of hypersonic and reusable launch vehicle propulsion systems. Teaming with other NASA centers, the Air Force, and industry, the Glenn Ceramics Branch has successfully tested multiple cooled CMC panel concepts in high-heat-flux, high-pressure, flowing rocket engine combustion gas environments. Sub-element components survived multiple cycles and the severe thermal gradients imposed by combustion gas temperatures in excess of 5500 F and cryogenic hydrogen or ambient temperature water internal coolants. These demonstrations are critical for the continued development of this class of materials, and the research is expected to continue with additional concepts and increasingly larger and more complex geometries being fabricated and tested in a broad range of engine operating conditions.

Author

Ceramic Matrix Composites; Reusable Launch Vehicles; Hypersonic Vehicles; Heat Flux; High Pressure; Cryogenic Temperature; Hydrogen; Rocket Exhaust; Composite Materials

20050196608 AYT Corp., OH, USA, NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA

Packaging Technology Developed for High-Temperature Silicon Carbide Microsystems

Chen, Liang-Yu; Hunter, Gary W.; Neudeck, Philip G.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

High-temperature electronics and sensors are necessary for harsh-environment space and aeronautical applications, such as sensors and electronics for space missions to the inner solar system, sensors for in situ combustion and emission monitoring, and electronics for combustion control for aeronautical and automotive engines. However, these devices cannot be used until they can be packaged in appropriate forms for specific applications. Suitable packaging technology for operation temperatures up to 500 C and beyond is not commercially available. Thus, the development of a systematic high-temperature packaging technology for SiC-based microsystems is essential for both in situ testing and commercializing high-temperature SiC sensors and electronics. In response to these needs, researchers at Glenn innovatively designed, fabricated, and assembled a new prototype electronic package for high-temperature electronic microsystems using ceramic substrates (aluminum nitride and aluminum oxide) and gold (Au) thick-film metallization. Packaging components include a ceramic packaging frame, thick-film metallization-based interconnection system, and a low electrical resistance SiC die-attachment scheme. Both the materials and fabrication process of the basic packaging components have been tested with an in-house-fabricated SiC semiconductor test chip in an oxidizing environment at temperatures from room temperature to 500 C for more than 1000 hr. These test results set lifetime records for both high-temperature electronic packaging and high-temperature electronic device testing. As required, the thick-film-based interconnection system demonstrated low (2.5 times of the room-temperature resistance of the Au conductor) and stable (decreased 3 percent in 1500 hr of continuous testing) electrical resistance at 500 C in an oxidizing environment. Also as required, the electrical isolation impedance between printed wires that were not electrically joined by a wire bond remained high (greater than 0.4 GW) at 500 C in air. The attached SiC diode demonstrated low (less than 3.8 W/mm2) and relatively consistent dynamic resistance from room temperature to 500 C. These results indicate that the prototype package and the compatible die-attach scheme meet the initial design standards for high-temperature, low-power, and long-term operation. This technology will be further developed and evaluated, especially with more mechanical tests of each packaging element for operation at higher temperatures and longer lifetimes.

Author

Electronic Packaging; High Temperature; Silicon Carbides; Fabrication; Semiconductors (Materials)

20050196690 NASA Glenn Research Center, Cleveland, OH, USA

Ballistic Impact of Braided Composites with a Soft Projectile

Roberts, Gary D.; Pereira, J. Michael; Revilock, Duane M., Jr.; Binienda, Wieslaw K.; Xie, Ming; Braley, Mike; July 29, 2002; 14 pp.; In English; 4th AIAA/ASME/AHS Structures, Dynamics and Materials Conference, 7-10 Apr. 2003, Norfolk, VA, USA

Contract(s)/Grant(s): RTOP 708-24-13

Report No.(s): E-14395; Copyright; Avail: CASI; A03, Hardcopy

Impact tests using a soft gelatin projectile were performed to identify failure modes that occur at high strain energy density during impact loading. Failure modes were identified for aluminum plates and for composites plates and half-rings made from triaxial carbon fiber braid having a 0/+/- 60deg architecture. For aluminum plates, a large hole formed as a result of crack propagation from the initiation site at the center of the plate. For composite plates, fiber tensile failure occurred in the back ply at the center of the plate. Cracks then propagated from this site along the +/-60deg fiber directions until triangular flaps opened to form a hole. For composite half-rings fabricated with 0deg fibers aligned circumferentially, fiber tensile failure also occurred in the back ply. Cracks first propagated from this site perpendicular the 0deg fibers. The cracks then turned to follow the +/-60deg fibers and 0deg fibers until rectangular flaps opened to form a hole. Damage in the composites was localized near the impact site, while cracks in the aluminum extended to the boundaries.

Author

Impact Tests; Projectiles; Gelatins; Failure Modes; Impact Loads; Metal Plates; Braided Composites; Crack Propagation

20050196697 NASA Glenn Research Center, Cleveland, OH, USA

Studies on Hot-Melt Prepregging on PRM-II-50 Polyimide Resin with Graphite Fibers

Shin, E. Eugene; Sutter, James K.; Juhas, John; Veverka, Adrienne; Klans, Ojars; Inghram, Linda; Scheiman, Dan; Papadopoulos, Demetrios; Zoha, John; Bubnick, Jim; [2004]; 16 pp.; In English; SAMPE 2003, 11-15 May 2003, Long Beach, CA, USA

Contract(s)/Grant(s): WBS 708-31-16

Report No.(s): E-14412; Copyright; Avail: CASI; A03, Hardcopy

A second generation PMR (in situ Polymerization of Monomer Reactants) polyimide resin PMR-II-50, has been considered for high temperature and high stiffness space propulsion composites applications for its improved high temperature performance. As part of composite processing optimization, two commercial prepregging methods: solution vs. hot-melt processes were investigated with M40J fabrics from Toray. In a previous study a systematic chemical, physical, thermal and mechanical characterization of these composites indicated the poor resin-fiber interfacial wetting, especially for the hot-melt process, resulted in poor composite quality. In order to improve the interfacial wetting, optimization of the resin viscosity and process variables were attempted in a commercial hot-melt prepregging line. In addition to presenting the results from the prepreg quality optimization trials, the combined effects of the prepregging method and two different composite cure methods, i.e. hot press vs. autoclave on composite quality and properties are discussed.
Author
Polyimide Resins; Prepregs

20050196699 NASA Glenn Research Center, Cleveland, OH, USA
Thermomechanical Properties of M40J Carbon/PMR-II-50 Composites
Allred, Ronald E.; Shin, E. Eugene; Inghram, Linda; McCorkle, Linda; Papadopoulos, Demetrios; Wheeler, Donald; Sutter, James K.; [2004]; 13 pp.; In English; SAMPE 2003, 11-15 May 2003, Long Beach, CA, USA
Contract(s)/Grant(s): WBS 708-31-16
Report No.(s): E-14411; Copyright; Avail: CASI; A03, Hardcopy

To increase performance and durability of high-temperature composites for potential rocket engine components, it is necessary to optimize wetting and interfacial bonding between high modulus carbon fibers and high-temperature polyimide resins. It has been previously demonstrated that the electro-oxidative shear treatments used by fiber manufacturers are not effective on higher modulus fibers that have fewer edge and defect sites in the surface crystallites. In addition, sizings commercially supplied on most carbon fibers are not compatible with polyimides. In this study, the surface chemistry and energy of high modulus carbon fibers (M40J and M60J, Torray) and typical fluorinated polyimide resins, such as PMR-II-50 were characterized. A continuous desizing system that uses an environmentally friendly chemical process was developed for low level fiber. Composites were fabricated with fibers containing the manufacturer's sizing, desized, and further treated with a reactive finish. Results of room temperatures tests show that desizing reduces interface sensitive properties compared to the manufacturer'ssizing and that subsequent surface re-treatment with reactive finish increases interface sensitive properties. Properties of thermally aged composites and composites with varying finish concentrations are also discussed.
Author
Carbon Fibers; Polyimides; Chemical Reactions

20050196702 NASA Glenn Research Center, Cleveland, OH, USA
Damage Assessment of Stress-Thermal Cycled high temperature
Ju, Jae-Hyung; Prochazka, Michael; Ronke, Ben; Morgan, Roger; Shin, Eugence; [2004]; 8 pp.; In English; 14th International Conference on Composite Materials, 14-18 Jul. 2003, San Diego, CA, USA
Contract(s)/Grant(s): WBS 708-31-16; Copyright; Avail: CASI; A02, Hardcopy

We report on the characterization of bismaleimide and polyimide carbon fiber composite, microcrack development under stress thermal cycling loading. Such cycles range from cryogenic temperatures associated with cryogenic fuel (LN, LOX) containment to high temperatures of 300 degrees Celsius associated with future hypervelocity aeropropulsion systems. Microcrack development thresholds as a function of temperature range of the thermal cycle; the number of cycles; the applied stress level imposed on the composite are reported. We have conducted stress-thermal cycles on thin bismaleimide-woven carbon fiber foils for three temperature range cycles: 1. Ambient temperature - -196 degrees celsius. 2. Ambient temperature - 150 degrees Celsius; 200 degrees Celsius; 250 degrees Celsius. 3. -196 degrees Celsius - 250 degrees Celsius. The Principle findings are that the full cycles from -196 degrees Celsius to to 250 degrees Celsius cause the most significant microcrack of development. These observations indicate that the high temperature portion of the cycle under load causes fiber-matrix interface failure and subsequent exposure to higher stresses at the cryogenic, low temperature region results in composite matrix microcracking as a result of the additional stresses associate with the fiber-matrix thermal expansion mismatch. Our initial studies for 12 ply PMR-II-50 polyimide/M60JB carbon fabric [0f,90f,90f,0f,0f,90f]ls composites will be presented. The stress-thermal cycle test procedure for these will be described. Moisture absorption characteristics between cycles will be used to monitor interconnected microcrack development. The applied stress level will be 75% of the composite cryogenic (-196 degrees Celsius) ultimate strength.
Author
Fiber-Matrix Interfaces; Polymer Matrix Composites; Fiber Composites; Carbon Fibers

20050196711 NASA Glenn Research Center, Cleveland, OH, USA

Local Debonding and Fiber Breakage in Composite Materials Modeled Accurately

Bednarcyk, Brett A.; Arnold, Steven M.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A prerequisite for full utilization of composite materials in aerospace components is accurate design and life prediction tools that enable the assessment of component performance and reliability. Such tools assist both structural analysts, who design and optimize structures composed of composite materials, and materials scientists who design and optimize the composite materials themselves. NASA Glenn Research Center's Micromechanics Analysis Code with Generalized Method of Cells (MAC/GMC) software package (http://www.grc.nasa.gov/WWW/LPB/mac) addresses this need for composite design and life prediction tools by providing a widely applicable and accurate approach to modeling composite materials. Furthermore, MAC/GMC serves as a platform for incorporating new local models and capabilities that are under development at NASA, thus enabling these new capabilities to progress rapidly to a stage in which they can be employed by the code's end users.

Derived from text

Composite Materials; Fiber Composites; Debonding (Materials)

20050196724 NASA Glenn Research Center, Cleveland, OH, USA

Characterizing The Chemical Stability Of High Temperature Materials For Application In Extreme Environments

Opila, Elizabeth; [2005]; 12 pp.; In English; 29th International Conference on Advanced Ceramics and Composition, 23-28 Jan. 2005, Cocooa Beach, FL, USA

Contract(s)/Grant(s): WBS 22-376-70-30-06; No Copyright; Avail: CASI; A03, Hardcopy

The chemical stability of high temperature materials must be known for use in the extreme environments of combustion applications. The characterization techniques available at NASA Glenn Research Center vary from fundamental thermodynamic property determination to material durability testing in actual engine environments. In this paper some of the unique techniques and facilities available at NASA Glenn will be reviewed. Multiple cell Knudsen effusion mass spectrometry is used to determine thermodynamic data by sampling gas species formed by reaction or equilibration in a Knudsen cell held in a vacuum. The transpiration technique can also be used to determine thermodynamic data of volatile species but at atmospheric pressures. Thermodynamic data in the Si-O-H(g) system were determined with this technique. Free Jet Sampling Mass Spectrometry can be used to study gas-solid interactions at a pressure of one atmosphere. Volatile Si(OH)4(g) was identified by this mass spectrometry technique. A High Pressure Burner Rig is used to expose high temperature materials in hydrocarbon-fueled combustion environments. Silicon carbide (SiC) volatility rates were measured in the burner rig as a function of total pressure, gas velocity and temperature. Finally, the Research Combustion Lab Rocket Test Cell is used to expose high temperature materials in hydrogen/oxygen rocket engine environments to assess material durability. SiC recession due to rocket engine exposures was measured as a function of oxidant/fuel ratio, temperature, and total pressure. The emphasis of the discussion for all techniques will be placed on experimental factors that must be controlled for accurate acquisition of results and reliable prediction of high temperature material chemical stability.

Author

Refractory Materials; High Temperature Environments; Stability; Thermodynamics

20050196732 NASA Glenn Research Center, Cleveland, OH, USA

Higher-Order Theory for Functionally Graded Materials

Aboudi, J.; Pindera, M. J.; Arnold, Steven M.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Functionally graded materials (FGM's) are a new generation of engineered materials wherein the microstructural details are spatially varied through nonuniform distribution of the reinforcement phase(s). Engineers accomplish this by using reinforcements with different properties, sizes, and shapes, as well as by interchanging the roles of the reinforcement and matrix phases in a continuous manner (ref. 1). The result is a microstructure that produces continuously or discretely changing thermal and mechanical properties at the macroscopic or continuum scale. This new concept of engineering the material's microstructure marks the beginning of a revolution both in the materials science and mechanics of materials areas since it allows one, for the first time, to fully integrate the material and structural considerations into the final design of structural components. Functionally graded materials are ideal candidates for applications involving severe thermal gradients, ranging from thermal structures in advanced aircraft and aerospace engines to computer circuit boards. Owing to the many variables that control the design of functionally graded microstructures, full exploitation of the FGM's potential requires the development of appropriate modeling strategies for their response to combined thermomechanical loads. Previously, most

computational strategies for the response of FGM's did not explicitly couple the material's heterogeneous microstructure with the structural global analysis. Rather, local effective or macroscopic properties at a given point within the FGM were first obtained through homogenization based on a chosen micromechanics scheme and then subsequently used in a global thermomechanical analysis.
Derived from text
Functionally Gradient Materials; Structural Design; Micromechanics

20050196804 NASA Glenn Research Center, Cleveland, OH, USA
High Strain Rate Behavior of Polymer Matrix Composites Analyzed
Goldberg, Robert K.; Roberts, Gary D.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Procedures for modeling the high-speed impact of composite materials are needed for designing reliable composite engine cases that are lighter than the metal cases in current use. The types of polymer matrix composites that are likely to be used in such an application have a deformation response that is nonlinear and that varies with strain rate. To characterize and validate material models that could be used in the design of impactresistant engine cases, researchers must obtain material data over a wide variety of strain rates. An experimental program has been carried out through a university grant with the Ohio State University to obtain deformation data for a representative polymer matrix composite for strain rates ranging from quasi-static to high rates of several hundred per second. This information has been used to characterize and validate a constitutive model that was developed at the NASA Glenn Research Center.
Derived from text
Polymer Matrix Composites; Composite Materials

20050196807 NASA Glenn Research Center, Cleveland, OH, USA, Toledo Univ., OH, USA
Uncertainties in the Thermal and Mechanical Properties of Particulate Composites Quantified
Murthy, Pappu L. N.; Mital, Subodh K.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Particle-reinforced composites are candidate materials for a wide variety of aerospace and nonaerospace applications. The high costs and technical difficulties involved with the use of many fiber-reinforced composites often limit their use in many applications. Consequently, particulate composites have emerged as viable alternatives to conventional fiber-reinforced composites. Particulate composites can be processed to near net shapepotentially reducing the manufacturing costs. They are candidate materials where shock or impact properties are important. For example, particle-reinforced metal matrix composites have shown great potential for many automotive applications. Typically, these materials are aluminum matrix reinforced with SiC or TiC particles. Reinforced concrete can also be thought of as a particle-reinforced composite. In situ ceramics can be modeled as particulate composites and are candidate materials for many high-temperature applications. The characterization of these materials is fundamental to their reliable use. It has been observed that the overall properties of these composites exhibit scatter because of the uncertainty in the constituent material properties, and fabrication-related parameters.
Derived from text
Particulate Reinforced Composites; Composite Materials; Mechanical Properties; Thermodynamic Properties

20050198874 NASA Glenn Research Center, Cleveland, OH, USA
A Model for the Oxidation of Carbon Silicon Carbide Composite Structures
Sullivan, Roy M.; [2004]; 40 pp.; In English
Report No.(s): E-14864; No Copyright; Avail: CASI; A03, Hardcopy

A mathematical theory and an accompanying numerical scheme have been developed for predicting the oxidation behavior of carbon silicon carbide (C/SiC) composite structures. The theory is derived from the mechanics of the flow of ideal gases through a porous solid. The result of the theoretical formulation is a set of two coupled nonlinear differential equations written in terms of the oxidant and oxide partial pressures. The differential equations are solved simultaneously to obtain the partial vapor pressures of the oxidant and oxides as a function of the spatial location and time. The local rate of carbon oxidation is determined using the map of the local oxidant partial vapor pressure along with the Arrhenius rate equation. The nonlinear differential equations are cast into matrix equations by applying the Bubnov-Galerkin weighted residual method, allowing for the solution of the differential equations numerically. The numerical method is demonstrated by utilizing the method to model the carbon oxidation and weight loss behavior of C/SiC specimens during thermogravimetric experiments.

The numerical method is used to study the physics of carbon oxidation in carbon silicon carbide composites.
Author
Composite Structures; Carbon-Carbon Composites; Silicon Carbides; Structural Engineering; Vapor Pressure; Thermogravimetry; Reaction Kinetics

20050198903 NASA Glenn Research Center, Cleveland, OH, USA
Characterization of Ceramic Matrix Composite Vane Subelements Subjected to Rig Testing in a Gas Turbine Environment
Verrilli, Michael; Calomino, Anthony; Thomas, David J.; Robinson, R. Craig; May 12, 2004; 7 pp.; In English; Fifth International Conference on High Temperature Ceramic Matrix Composites, 12-16 Sep. 2004, Seattle, WA, USA
Contract(s)/Grant(s): 22-714-30-18
Report No.(s): E-14754; No Copyright; Avail: CASI; A02, Hardcopy

Vane subelements were fabricated from a silicon carbide fiber-reinforced silicon carbide matrix (SiC/SiC) composite. A cross-sectional slice of an aircraft engine metal vane was the basis of the vane subelement geometry. To fabricate the small radius of the vane's trailing edge using stiff Sylramic SiC fibers, a unique SiC fiber architecture was developed. A test configuration for the vanes in a high pressure gas turbine environment was designed and fabricated. Testing was conducted using a pressure of 6 atm and combustion flow rate of 0.5 kg/sec, and consisted of fifty hours of steady state operation followed by 102 2-minute thermal cycles. A surface temperature of 1320 C was obtained for the EBC-coated SiC/SiC vane subelement. This paper will briefly discuss the vane fabrication, test configuration, and results of the vane testing. The emphasis of the paper is on characterization of the post-test condition of the vanes.
Author
Ceramic Matrix Composites; Silicon Carbides; Vanes

20050198935 NASA Glenn Research Center, Cleveland, OH, USA
High Temperature Chemistry in the Columbia Accident Investigation
Jacobson, Nathan; Opila, Elizabeth; Tallant, David; Simpson, Regina; [2004]; 17 pp.; In English; Gordon Research Conference on High Temperature Materials, Processes and Diagnostics, 1-6 Aug. 2004, Waterville, ME, USA
Contract(s)/Grant(s): DE-AC04-94AL-85000; WBS 22-376-70-30-01
Report No.(s): E-14765; No Copyright; Avail: CASI; A03, Hardcopy

Initial estimates on the temperature and conditions of the breach in Columbia's wing focused on analyses of the slag deposits. These deposits are complex mixtures of the reinforced carbon/carbon (RCC) constituents, insulation material, and wing structural materials. However it was possible to clearly discern melted/solidified Cerachrome(R) insulation, indicating the temperatures had exceeded 1760 C. Current research focuses on the carbon/carbon in the path from the breach. Carbon morphology indicates heavy oxidation and erosion. Raman spectroscopy yielded further temperature estimates. A technique developed at Sandia National Laboratories is based on crystallite size in carbon chars. Lower temperatures yield nanocrystalline graphite; whereas higher temperatures yield larger graphite crystals. By comparison to standards the temperatures on the recovered RCC fragments were estimated to have been greater than 2700 C.
Author
Aircraft Accident Investigation; Carbon-Carbon Composites; High Temperature; Columbia (Orbiter)

20050198937 QSS Group, Inc., Cleveland, OH, USA, Ohio Aerospace Inst., Cleveland, OH, USA
Active Metal Brazing of Carbon-Carbon Composites to Titanium
Singh, M.; Shpargel, T. P.; Morscher, G.; Asthana, R.; [2004]; 6 pp.; In English; 5th International Conference on High Temperature Ceramic Matrix Composites, 12-16 Sep. 2004, Seattle, WA, USA
Contract(s)/Grant(s): NAS3-00145; 22-973-80-50
Report No.(s): E-14795; No Copyright; Avail: CASI; A02, Hardcopy

The Ti-metal/C-C composite joints were formed by reactive brazing with three commercial brazes, namely, Cu-ABA, TiCuNi, and TiCuSil. The joint microstructures were examined using optical microscopy, and scanning electron microscopy (SEM) coupled with energy dispersive spectrometry (EDS). The results of the microstructure analysis indicate solute redistribution across the joint which led to good wetting, spreading, and metallurgical bond formation via interdiffusion.
Author
Carbon-Carbon Composites; Brazing; Titanium

20050198960 NASA Glenn Research Center, Cleveland, OH, USA

Durability and Design Issues of Thermal/Environmental Barrier Coatings on SiC/SiC Ceramic Matrix Composites under 1650 C Test Conditions

Zhu, Dong-Ming; Choi, Sung R.; Ghosn, Louis J.; Miller, Robert A.; [2004]; 23 pp.; In English; Symposium on Advanced Ceramic Coatings for Structural, Environmental and Functional Application, 25-30 Jan. 2004, Cocoa Beach, FL, USA

Contract(s)/Grant(s): WBS 22-714-04-30

Report No.(s): E-14798; No Copyright; Avail: CASI; A03, Hardcopy

Ceramic thermal/environmental barrier coatings for SiC-based ceramics will play an increasingly important role in future gas turbine engines because of their ability to effectively protect the engine components and further raise engine temperatures. However, the coating durability remains a major concern with the ever-increasing temperature requirements. Currently, advanced T/EBC systems, which typically include a high temperature capable zirconia- (or hahia-) based oxide top coat (thermal barrier) on a less temperature capable mullite/barium-strontium-aluminosilicate (BSAS)/Si inner coat (environmental barrier), are being developed and tested for higher temperature capability Sic combustor applications. In this paper, durability of several thermal/environmental barrier coating systems on SiC/SiC ceramic matrix composites was investigated under laser simulated engine thermal gradient cyclic, and 1650 C (3000 F) test conditions. The coating cracking and delamination processes were monitored and evaluated. The effects of temperature gradients and coating configurations on the ceramic coating crack initiation and propagation were analyzed using finite element analysis (FEA) models based on the observed failure mechanisms, in conjunction with mechanical testing results. The environmental effects on the coating durability will be discussed. The coating design approach will also be presented.

Author

Durability; Temperature Gradients; Thermal Control Coatings; Ceramic Matrix Composites

20050198964 NASA Glenn Research Center, Cleveland, OH, USA

Actively Cooled Ceramic Matrix Composite Concepts for High Heat Flux Applications

Eckel, Andrew J.; Jaskowiak, Martha H.; Dickens, Kevin; [2004]; 27 pp.; In English; Fifth International Conference on High Temperature Ceramic Matric Composites, 12-16 Sep. 2004, Seattle, WA, USA

Contract(s)/Grant(s): WBS 22-794-20-66

Report No.(s): E-14885; No Copyright; Avail: CASI; A03, Hardcopy

High temperature composite heat exchangers are an enabling technology for a number of aeropropulsion applications. They offer the potential for mass reductions of greater than fifty percent over traditional metallics designs and enable vehicle and engine designs. Since they offer the ability to operate at significantly higher operating temperatures, they facilitate operation at reduced coolant flows and make possible temporary uncooled operation in temperature regimes, such as experienced during vehicle reentry, where traditional heat exchangers require coolant flow. This reduction in coolant requirements can translate into enhanced range or system payload. A brief review of the approaches, challenges and test results are presented, along with a status of recent government-funded projects.

Author

Ceramic Matrix Composites; Heat Exchangers; Cooling; Refractory Materials

20050199070 NASA Langley Research Center, Hampton, VA, USA

Stress Analysis of Composite Cylindrical Shells With an Elliptical Cutout

Nemeth, M. P.; Oterkus, E.; Madenci, E.; [2005]; 22 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA

Contract(s)/Grant(s): 23-376-70-30-30

Report No.(s): AIAA Paper 2005-1824; Copyright; Avail: CASI; A03, Hardcopy

A special-purpose, semi-analytical solution method for determining the stress and deformation fields in a thin laminated-composite cylindrical shell with an elliptical cutout is presented. The analysis includes the effects of cutout size, shape, and orientation; nonuniform wall thickness; oval-cross-section eccentricity; and loading conditions. The loading conditions include uniform tension, uniform torsion, and pure bending. The analysis approach is based on the principle of stationary potential energy and uses Lagrange multipliers to relax the kinematic admissibility requirements on the displacement representations through the use of idealized elastic edge restraints. Specifying appropriate stiffness values for the elastic extensional and rotational edge restraints (springs) allows the imposition of the kinematic boundary conditions in an indirect manner, which enables the use of a broader set of functions for representing the displacement fields. Selected results

of parametric studies are presented for several geometric parameters that demonstrate that analysis approach is a powerful means for developing design criteria for laminated-composite shells.
Author
Stress Analysis; Composite Structures; Cylindrical Shells; Design Analysis; Stress Distribution; Lagrange Multipliers; Laminates

20050199399 NASA Langley Research Center, Hampton, VA, USA
Mechanical Properties of Nanostructured Materials Determined Through Molecular Modeling Techniques
Clancy, Thomas C.; Gates, Thomas S.; [2005]; 16 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 23-762-55-LC; No Copyright; Avail: CASI; A03, Hardcopy

The potential for gains in material properties over conventional materials has motivated an effort to develop novel nanostructured materials for aerospace applications. These novel materials typically consist of a polymer matrix reinforced with particles on the nanometer length scale. In this study, molecular modeling is used to construct fully atomistic models of a carbon nanotube embedded in an epoxy polymer matrix. Functionalization of the nanotube which consists of the introduction of direct chemical bonding between the polymer matrix and the nanotube, hence providing a load transfer mechanism, is systematically varied. The relative effectiveness of functionalization in a nanostructured material may depend on a variety of factors related to the details of the chemical bonding and the polymer structure at the nanotube-polymer interface. The objective of this modeling is to determine what influence the details of functionalization of the carbon nanotube with the polymer matrix has on the resulting mechanical properties. By considering a range of degree of functionalization, the structure-property relationships of these materials is examined and mechanical properties of these models are calculated using standard techniques.
Author
Nanotubes; Mechanical Properties; Epoxy Matrix Composites; Carbon Nanotubes; Chemical Bonds

20050199401 NASA Langley Research Center, Hampton, VA, USA
Hydrogen Permeability of Polymer Matrix Composites at Cryogenic Temperatures
Grenoble, Ray W.; Gates, Thomas S; [2005]; 8 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA
Contract(s)/Grant(s): 23-064-50
Report No.(s): AIAA Paper 2005-2086; No Copyright; Avail: CASI; A02, Hardcopy

This paper presents experimental methods and results of an ongoing study of the correlation between damage state and hydrogen gas permeability of laminated composite materials under mechanical strains and thermal loads. A specimen made from IM-7/977-2 composite material has been mechanically cycled at room temperature to induce microcrack damage. Crack density and tensile modulus were observed as functions of number of cycles. Damage development was found to occur most quickly in the off-axis plies near the outside of the laminate. Permeability measurements were made after 170,000 cycles and 430,000 cycles. Leak rate was found to depend on applied mechanical strain, crack density, and test temperature.
Author
Cryogenic Temperature; Polymer Matrix Composites; Composite Materials; Hydrogen; Permeability; Cracks

20050199430 NASA Glenn Research Center, Cleveland, OH, USA, National Center for Microgravity Research on Fluids and Combustion, USA
Flame Synthesis Used to Create Metal-Catalyzed Carbon Nanotubes
VanderWal, Randy L.; Research and Technology 2000; March 2001; 2 pp.; In English
Contract(s)/Grant(s): NAC3-546; No Copyright; Avail: CASI; A01, Hardcopy

Metal-catalyzed carbon nanotubes are highly ordered carbon structures of nanoscale dimensions. They may be thought of as hollow cylinders whose walls are formed by single atomic layers of graphite. Such cylinders may be composed of many nested, concentric atomic layers of carbon or only a single layer, the latter forming a single-walled carbon nanotube. This article reports unique results using a flame for their synthesis. Only recently were carbon nanotubes discovered within an arc discharge and recognized as fullerene derivatives. Today metal-catalyzed carbon nanotubes are of great interest for many reasons. They can be used as supports for the metal catalysts like those found in catalytic converters. Open-ended nanotubes are highly desirable because they can be filled by other elements, metals or gases, for battery and fuel cell applications.

Because of their highly crystalline structure, they are significantly stronger than the commercial carbon fibers that are currently available (10 times as strong as steel but possessing one-sixth of the weight). This property makes them highly desirable for strengthening polymer and ceramic composite materials. Current methods of synthesizing carbon nanotubes include thermal pyrolysis of organometallics, laser ablation of metal targets within hydrocarbon atmospheres at high temperatures, and arc discharges. Each of these methods is costly, and it is unclear if they can be scaled for the commercial synthesis of carbon nanotubes. In contrast, flame synthesis is an economical means of bulk synthesis of a variety of aerosol materials such as carbon black. Flame synthesis of carbon nanotubes could potentially realize an economy of scale that would enable their use in common structural materials such as car-body panels. The top figure is a transmission electron micrograph of a multiwalled carbon nanotube. The image shows a cross section of the atomic structure of the nanotube. The dark lines are individual atomic layer planes of carbon, seen here in cross section. They form a nested series of concentric cylinders, much like the growth rings on a tree. This sample was obtained by the supported catalyst method, whereby the nanoscale catalysts are dispersed on a substrate providing their support. The substrate with catalyst particles was immersed within an acetylene diffusion flame to which nitrogen had been added to eliminate soot formation. Upon removal from the flame, the nanotubes were dispersed on a holder suitable for electron microscopy. Although not seen in the figure, the tube diameter reflects that of the catalyst particle. Author

Diffusion Flames; Carbon Nanotubes; Catalysis; Organometallic Compounds; Nanostructure Growth; Fullerenes; Composite Materials

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INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

20050188572 Air Force Research Lab., Edwards AFB, CA USA

Polyazide Chemistry Preparation and Characterization of As(N3)5, Sb(N3)5 and P(C6H5)4Sb(N3)6

Haiges, Ralf; Boatz, Jerry A.; Vij, Ashwani; Vij, Vandana; Gerken, Michael; Schneider, Stefan; Schroer, Thorsten; Yousufuddin, Muhammed; Christe, Karl O.; Sep. 2004; 19 pp.; In English

Contract(s)/Grant(s): Proj-DARP

Report No.(s): AD-A434143; AFRL-PR-ED-JA-2004-287; No Copyright; Avail: CASI; A03, Hardcopy

The binary arsenic- and antimony azide species AS(N3)3, As(N3)4+, As(N3)4-, As(N3)6-, Sb(N3)3, Sb(N3)4+, Sb(N3)4- and Sb(N3)6- have previously been reported, and the crystal structures of As(N3)3, Sb(N3)3 and As(N3)6- were determined. In addition, the Lewis based stabilized species M(N3)5-LB (M=As,Sb; LB=pyridine, quinoline NH3, N2H4, NH2CN) were published. However, previous attempts to obtain the neat pentaazides of arsenic and antimony were not successful. Even at low temperatures, attempted syntheses resulted in explosions that were described as 'so intense that only pulverized glass remained.' Furthermore, As(N3)5 was predicted to be a 'highly unstable compound,' based on its analogy to AsCl5. In this paper, we wish to communicate the synthesis and characterization of neat As(N3)5 and Sb(N3)5, and their conversion to the As(N3) 6 and Sb(N3)6 anions, respectively. We also report the crystal structure of P(C6H5)4Sb(N3)6.
DTIC

Anions; Antimony; Arsenic; Azides (Inorganic); Azides (Organic); Crystal Structure

20050188605 Ohio State Univ., Columbus, OH USA

Effects of Stress on Localized Corrosion in Al and Al Alloys

Frankel, Gerald S.; Rokhlin, Stanislav I.; Apr. 2005; 173 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0148

Report No.(s): AD-A434227; GRT869577/742142; AFRL-SR-AR-TR-05-0205; No Copyright; Avail: CASI; A08, Hardcopy

In order to predict the development of corrosion, a fundamental understanding of the corrosion processes is required. In particular, the effects of mechanical stress on corrosion and their synergistic interactions must be understood. In this project, certain effects of stress on localized corrosion in AA2024-T3 were studied by a variety of techniques, including in situ microfocal x-ray radiography. Specifically oriented slices of material were taken from a wrought plate, stressed in tension either to a fixed displacement or a fixed load, exposed to special electrochemical cells, and imaged by radiography. These experiments image the full distribution of corrosion sites and allow for competition between seen to stop growing and be overtaken by another crack that had been shorter. Quantitative aspects of phase-contrast microfocus X-ray imaging of Al alloys

have been developed. Phase-contrast X-ray imaging provides enhanced image contrast and improved edge definition and is important for further development toward NDE of structural materials. The effects of compressive stress and prior deformation on localized corrosion have also been studied. The first breakdown in AA7075-T6 has been shown to be caused by transient dissolution of a surface active layer created by deformation during sample preparation.
DTIC
Aluminum; Aluminum Alloys; Corrosion; Kinetics; Stress Corrosion

20050188667 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Modeling Application of Hydrogen Release Compound to Effect In Situ Bioremediation of Chlorinated Solvent - Contaminated Groundwater
Wood, Ryan C.; Mar. 2005; 134 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434317; AFIT/GEM/ENV/05M-14; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study investigates how application of Hydrogen Release Compound (HRC) might be implemented to remediate a site contaminated with tetrachloroethene (PCE) or its daughter products, under varying site conditions. The 3-D reactive transport model RT3D was coupled with a dual-Monod biodegradation submodel to simulate the effect of the hydrogen generated by HRC on accelerating the biodegradation of dissolved chlorinated solvents. Varying site conditions and injection well configurations were investigated to determine the effect of these environmental and design conditions on overall treatment efficiency. The model was applied to data obtained at a chlorinated solvent contaminated site at Vandenberg AFB, where a pilot study of HRC injection was conducted. Historical data were initially used to calibrate the model, under the assumption that natural reductive dehalogenation processes are occurring at the site. The model was then applied to predict how HRC injection enhances natural attenuation processes. Model predictions were compared to the results of the pilot study. The model-simulated concentrations were relatively consistent with concentrations measured at the site, indicating the model may be a useful design tool, as well as an aid to help us better understand how HRC injection may enhance natural attenuation of chlorinated solvents.
DTIC
Biodegradation; Chlorination; Contamination; Ground Water; Hydrogen Compounds; Solvents; Water Pollution

20050188681 General Atomics Co., San Diego, CA USA
CADs Hydrolysis/Supercritical Water Oxidation Prototype Demil Facility
Elliott, Jim; Hurley, Jim; Rising, Stan; Snyder, Ron; Mar. 2005; 3 pp.; In English
Contract(s)/Grant(s): F08630-02-C-0083; Proj-DODT
Report No.(s): AD-A434333; No Copyright; Avail: CASI; A01, Hardcopy

Under a cooperative effort between General Atomics (GA), Tooele Army Depot (TEAD), the Defense Ammunition Center (DAC), the Air Force at Tyndall AFB (AF), and Joint Munitions Command (JMC), a Hydrolysis Production Prototype Plant (HPPP) is being constructed at TEAD. The major equipment items are scheduled for delivery to site early this summer. In addition, funding has been obtained to add a supercritical water oxidation (SCWO) unit at TEAD for processing of the HPPP hydrolysate. This new equipment will provide TEAD with the technology necessary to demil obsolete aluminum-bodied cartridge actuated devices (CADs) currently in storage at TEAD. CADs are compact, energetic containing devices commonly used on aircraft. There are over 15,000 tons of obsolete CADs and propellant actuated devices (PADs) in storage at various Army Ammunition Plants with the inventory growing daily. Currently there is no effective way to demil these items which occupy approximately 60 storage bunkers at TEAD alone. The HPPP/SCWO systems will provide TEAD with the capability to begin working down that inventory, thus freeing up badly needed storage space at the depot.
DTIC
Cartridges; Hydrolysis; Oxidation; Prototypes; Water; Water Treatment

20050188733 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Electrical Activation Studies of Silicon Implanted Al(x)Ga(1-x)N
Zens, Timothy W.; Mar. 2005; 74 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434437; AFIT/GAP/ENP/05-08; No Copyright; Avail: Defense Technical Information Center (DTIC)

Electrical activation studies of silicon implanted Al(x)Ga(1-x)N grown on sapphire substrates were conducted as a function of ion dose, anneal temperature, and anneal time. Silicon ion doses of 1x10(exp 13), 5x10(exp 13), and 1x10(exp 14) /sq cm were implanted in Al(x)Ga(1-x)N samples with aluminum mole fractions of 0.1 and 0.2 at an energy of 200 keV at room temperature. The samples were proximity cap annealed at temperatures from 1100 to 1350 degrees C and anneal times

of 20 to 40 minutes with a 500 thick AlN cap in a nitrogen environment. The Hall coefficient and resistivity were measured using room temperature Hall effect measurements. From this data the Hall mobility, sheet carrier concentration, and electrical activation efficiencies were calculated. Activation efficiencies of almost 100% were achieved for Al(0.2)Ga(0.8)N samples having doses of 5x10(exp 13) and 1x10(exp 14) /sq cm after annealing at 1350 and 1300 C, respectively, for 20 minutes. After annealing at 1250 C for 20 minutes, 87% efficiency was achieved for Al(0.1)Ga(0.9)N implanted with 1x10(exp 14) /sq cm silicon ions. The largest observed mobility was 89 /sq cm/V's for Al(0.1) Ga(0.9)N implanted with 1x10(exp 14) /sq cm and 5x10(exp 13) /sq cm silicon ions and annealed at 1250 degrees C for 20 minutes and at 1200 degrees C for 40 minutes, respectively. The optimal anneal condition to maximize electrical activation efficiency and minimize nitrogen dissociation damage for Al(0.1)Ga(0. 9)N was 1200 C anneal for 40 minutes. The mobilities, sheet carrier concentrations, and electrical activation efficiencies generally increased.
DTIC
Aluminum Nitrides; Gallium Nitrides; Ion Implantation; Silicon; Substrates

20050188737 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Investigation into Palladium-Catalyzed Reduction of Perchlorate in Water
Barney, Eric G.; Mar. 2005; 203 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434460; AFIT/GES/ENV/05M-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this study, application of a catalytic reactor to facilitate chemical reduction of perchlorate was investigated. Palladium-coated pellets were used as the catalyst, and formic acid was used as the reductant. Reactor performance was evaluated under a variety of operating conditions (influent pH, reductant concentration, residence time). Very little perchlorate reduction was observed under any operating condition. At best, approximately 8% perchlorate reduction was observed. This small reduction efficiency is clearly not sufficient for environmental treatment applications. Perchlorate strongly adsorbed to the catalyst at low pH (3 - 3.3). At higher pH (4 - 10), little adsorption was observed. This pH behavior may be the result of dissociation of formic acid (pKa ^ 3.75). It is possible that perchlorate reduction was limited by the amount and speciation of formic acid in the system. Maximum perchlorate reduction was observed at high reductant concentration (10 millimolar formic acid) and low pH (minimized dissociation of formic acid to formation). Increasing the formic acid concentration and reducing the upward pH drift of the bulk fluid (via reduced residence time) may improve perchlorate reduction.
DTIC
Catalysis; Palladium; Perchlorates; Water

20050188788 Massachusetts Inst. of Tech., Cambridge, MA USA
Chemical Characterization of Dissolved Organic Matter (DOM) in Seawater: Structure, Cycling and the Role of Biology
Quan, Tracy M.; Feb. 2005; 215 pp.; In English
Report No.(s): AD-A434551; MIT/WHOI-2005-05; No Copyright; Avail: CASI; A10, Hardcopy

The goal of this thesis is to investigate three different areas relating to the characterization of dissolved organic matter (DOM). The first section used periodate over-oxidation to analyze the previously unidentified fraction of HMWDOM. The majority of the carbon in two HMWDOM samples was over-oxidation, including 70% of the aliphatic NMR signal, with a high degree of branching. Based on the HNMR spectra data, it was concluded that 6-deoxysugars were the primary compounds in the unidentified fraction of HMWDOM. In the second section, a new method was presented for the purification of individual underivatized amino acids hydrolyzed from HMWDOM, using cation exchange chromatography and high-pressure liquid chromatography (HPLC) with C18 and strong cation exchange (SCX) columns. Six amino acids were isolated from HMWDOM with sufficient purity and quantity for radiocarbon analysis. These amino acids had a range of delta(exp 14) C values, from 121% to -454%. The final section investigates biological controls on dissolved organic nitrogen (DON). Total hydrolyzable amino acids (THAA), and nucleic acids were measured for four incubations: a control, a grazer added, a zero virus, and a 10 times virus. Comparison to the control showed THAA and nucleic acid release were influenced by viruses but not grazers.
DTIC
Amino Acids; Cycles; Dissolved Organic Matter; Dissolving; Hydrolysis; Molecular Weight; Nitrogen

20050188814 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Analysis of Ebola Virus and VLP Release Using an Immunocapture Assay
Kallstrom, George; Warfield, Kelly L.; Swenson, Dana L.; Mort, Shannon; Panchal, Rekha G.; Ruthel, Gordon; Bavari, Sina; Aman, M. J.; Apr. 2005; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434596; RPP-04-459; No Copyright; Avail: Defense Technical Information Center (DTIC)

Ebola virus (EBOV), an emerging pathogen, is the causative agent of a rapidly progressive hemorrhagic fever with high mortality rates. There are currently no approved vaccines or treatments available for Ebola hemorrhagic fever. Standard plaque assays are currently the only reliable techniques for enumerating the virus. Effective drug-discovery screening as well as target identification and validation require simple and more rapid detection methods. This report describes the development of a rapid ELISA that measures virus release with high sensitivity. This assay detects both Ebola virus and EBOV-like particles (VLPs) directly from cell-culture supernatants with the VP40 matrix protein serving as antigen. Using this assay, the contribution of the EBOV nucleocapsid (NC) proteins in VLP release was determined. These findings indicate that a combination of NC proteins together with the envelope components is optimal for VLP formation and release, a finding that is important for vaccination with Ebola VLPs. Furthermore, this assay can be used in surrogate models in non-biocontainment environment, facilitating both basic research on the mechanism of EBOV assembly and budding as well as drug-discovery research.
DTIC
Assaying; Viruses

20050194612 Gas Technology Inst., Des Plaines, IL, USA
Development and Evaluation of Nanoscale Sorbents for Mercury Capture from Warm Fuel Gas. Shakedown Testing of the Experimental System (Task 1)
Jadhav, R. A.; Jan. 2005; 14 pp.; In English
Report No.(s): DE2005-836995; No Copyright; Avail: Department of Energy Information Bridge

The Mercury Testing Experimental System available in GTI's Hot Gas Cleanup laboratory was prepared for the project. As part of the shakedown testing, the system was checked for possible gas leaks and fixed. In addition, the mass flow controller was calibrated for diluent N2 stream. A major part of the shakedown testing was the calibration of the semi-continuous mercury analyzer and the verification of the permeation rate of the mercury permeation tube. It was found that the analyzer's mercury concentration measurements were much lower than expected from the permeation tube rate calculations. Vendors of the analyzer and the permeation tube are contacted to find out the reason for this discrepancy.
NTIS
Sorbents; Evaluation; High Temperature Gases; Test Equipment

20050194629 Pennsylvania State Univ., University Park, PA, USA
Influence of MSI (Metal-Support Interactions) and the Solvent in Liquid-Phase Reactions. Final Report
May 2003; 14 pp.; In English
Report No.(s): DE2005-824023; No Copyright; Avail: Department of Energy Information Bridge

Results were repeatedly obtained that were consistent with a hypothesis proposed at the beginning of this program, i.e., due to Metal-Support Interactions (MSI), unique active sites can be created in the metal-support interfacial region to enhance activity and improve selectivity in certain types of reactions, especially those involving the hydrogenation of carbonyl and unsaturated C=C bonds. Higher turnover frequencies (TOF-molecule/s/site) and increased selectivity for C=O bond versus C=C bond hydrogenation was established in the hydrogenation reactions of: acetone, crotonaldehyde, acetophenone, phenylethanol, acetylcyclohexane, benzaldehyde, benzyl alcohol, phenylacetaldehyde and citral over Pt/TiO2 MSI catalysts. Higher rates of hydrogenation benzene, toluene and xylene could be obtained over certain supported Pt and Pd catalysts. Au/TiO(sub 2) catalysts were developed that were active for CO hydrogenation at subambient temperatures. The influence of support and metal crystallite size were established for the adsorption of H2, CO and O2 on families of Pt and Pd catalysts.
NTIS
Catalysts; Organic Compounds; Solvents

20050194630 Gordon Research Conferences, Inc., Kingston, RI, USA
Gordon Research Conference on Organometallic Chemistry
Jul. 2003; 14 pp.; In English; Gordon Research Conference on Organometallic Chemistry, 21-26 Jul. 2002, Newport, RI, USA
Report No.(s): DE2005-823981; No Copyright; Avail: Department of Energy Information Bridge

The Gordon Research Conference (GRC) on Organometallic Chemistry was held at Salve Regina, Newport, Rhode Island, July 21-26, 2002. The conference was well attended with 112 participants (list enclosed). The attendees represented the spectrum of endeavor in this field coming from academia, industry, and government laboratories, both US and foreign scientists, senior researchers, young investigators, and students. In designing the formal speakers program, emphasis was

placed on current unpublished research and discussion of the future target areas in this field. There was a conscious effort to stimulate lively discussion about the key issues in the field today.
NTIS
Conferences; Organometallic Compounds; Organic Chemistry

20050194643 Wisconsin Univ., Milwaukee, WI, USA
Investigation of Model Catalyzed Hydrocarbon Formation Reactions. Final Technical Report
Tysoe, W. T.; May 2001; 18 pp.; In English
Report No.(s): DE2005-834076; No Copyright; Avail: Department of Energy Information Bridge
Work was focused on two areas aimed at understanding the chemistry of realistic catalytic systems: (1) The synthesis and characterization of model supported olefin metathesis catalysts. (2) Understanding the role of the carbonaceous layer present on Pd(111) single crystal model catalysts during reaction.
NTIS
Alkenes; Catalysis; Catalysts; Hydrocarbons

20050194646 Los Alamos National Lab., NM USA
Micelle Formation and Surface Interactions in Supercritical CO2. Fundamental Studies for the Extraction of Actinides from Contaminated Surfaces. Final Report, October 98-September 01
McCleskey, T. M.; Birnbaum, E. R.; January 2005; 26 pp.; In English
Report No.(s): DE2005-831193; No Copyright; Avail: Department of Energy Information Bridge
The nitric acid/potassium permanganate/oxalic acid (NPOx) Phase II system is being prepared for remote operation at the Idaho National Engineering and Environmental Laboratory (INEEL). Several tests have been conducted to prepare the system for remote operation. This system performs very well with high decontamination efficiencies and very low quantities of waste generated during decontamination.
NTIS
Actinide Series; Carbon Dioxide; Contamination; Decontamination; Extraction; Micelles; Radioactive Materials; Surface Reactions; Surfactants

20050194647 Tennessee Univ., Memphis, TN, USA
Improved Modeling of Transition Metals. Application to Catalysis and Technetium Chemistry
Cundari, T. R.; Jun. 2005; 18 pp.; In English
Report No.(s): DE2005-833745; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Catalysis; Technetium; Transition Metals

20050194655 Lawrence Livermore National Lab., Livermore, CA USA
Detalied Modeling Study of Propane Oxidation
Curran, H. J.; Jayaweera, T. M.; Pitz, W. J.; Westbrook, C. K.; Mar. 22, 2004; 12 pp.; In English
Report No.(s): DE2005-15013956; UCRL-CONF-203063; No Copyright; Avail: Department of Energy Information Bridge
Propane is the simplest hydrocarbon that is employed as a practical hydrocarbon jet fuel; its thermochemcial and combustion properties more closely reflect those of larger hydrocarbon fuels than either methane or ethane. The development of detailed chemical kinetic mechanisms are needed to obtain accurate models of fuel oxidation rates in practical combustion devices such as internal combustion engines and gas turbines. Thus, a chemical kinetic mechanism which accurately describes the oxidation behaviour of propane over a wide range of conditions (temperature, pressure and equivalence ratio) in a broad range of sampling systems (a jet-stirred reactor, flow reactors, shock tubes, counterflow diffusion flames, and burner-stabilized flames) is extremely important to the combustion community. To this end, there have been a number of detailed chemical modeling studies carried out on propane oxidation all more than ten years ago, with the most recent modeling study being performed at high pressures and in the low to intermediate temperature range by Koert et al. in 1996. It is the aim of this work to validate a new chemical kinetic mechanism using flow reactor data, and shock tube ignition delay measurements at low temperatures (900-1100 K), and at high temperatures (1350-1800 K).
NTIS
Oxidation; Propane; Mathematical Models; Hydrocarbon Fuels; Jet Engine Fuels; Combustion Chemistry

20050194683 Lawrence Livermore National Lab., Livermore, CA USA

Coefficient of Thermal Expansion of the Beta and Delta Polymorphs of HMX

Weese, R. K.; Burnham, A. K.; Maienschein, J. L.; Aug. 09, 2004; 16 pp.; In English

Report No.(s): DE2005-15014686; UCRL-CONF-205884; No Copyright; Avail: Department of Energy Information Bridge

Dimensional changes related to temperature cycling of the beta and deltapolymorphs of HMX (octahydro-1, 3,5,7-tetranitro- 1,3,5,7-tetrazocine) areimportant for a variety of applications. The coefficient of thermal expansion (CTE) of the beta and delta phases are measured and reported in this work over a temperature range of 20 degrees C to 215 degrees C. In addition, dimensional changes associated with the phase transition were measured, both through the transition and back down. Initially, differential scanning calorimetry (DSC) was used to investigate back conversion of the delta phase to the beta phase polymorph. The most successful approach was first to measure the amount of the beta to deltaconversion, then after a given cooling period a repeat analysis, to measure the heat consumed by a second pass through the beta to delta phase transition. In addition, TMA is used to measure the dimensional change of a 0.20-gram sample of HMX during its initial heating and then three days later during a 2nd heating. This HMX shows the beta to delta phase transition a second time, thereby confirming the back conversion from delta to beta phase HMX.

NTIS

Chemical Explosions; Hmx; Thermal Expansion; Polymorphism

20050194715 Department of Energy, Chicago, IL, USA

Symposium on Microscale Separations and Analysis

Aug. 27, 2001; 10 pp.; In English

Report No.(s): DE2005-821085; No Copyright; Avail: Department of Energy Information Bridge

The 'Symposium on Microscale Separations and Analysis' event, held as a section of the American Chemical Society Annual meeting on 27 August 2001, brought together engineers, physicists, and chemists from both academia and industry to discuss the latest research in the area of biomolecule analysis on microfluidic devices for genomic and proteomic applications. The speakers who gave the invited lectures, and the topics of the talks they gave, are briefly described.

NTIS

Biochemistry; Conferences; Molecules

20050195844 NASA Glenn Research Center, Cleveland, OH, USA, National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA

Flame Design: A Novel Approach Developed to Produce Clean, Efficient Diffusion Flames

Axelbaum, Richard L.; Urban, David L.; Sunderland, Peter B.; Chao, Beei-Huan; Research and Technology 1999; March 2000; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Soot formation and flame extinction are vital concerns in the combustion of fossil fuels. In particular, soot is responsible for pollutant emissions, and extinction can cause inefficient or unstable burning. Normal-gravity experiments have demonstrated that flames can be designed to improve both characteristics by redirecting some or all of the nitrogen from the oxidizer into the fuel. Such nitrogen exchange can produce permanently blue flames, which are soot free under all possible flame conditions. Furthermore, this approach can lead to stronger, extinction-resistant flames. Past investigations of nitrogen exchange were unable to identify the physical mechanisms responsible for its benefits because these mechanisms cannot be isolated when normal-gravity flames are studied. In contrast, the Diffusion Flame Extinction and Soot Inception (DESI) experiment considers spherical flames, where nearly perfect spherical symmetry affords new levels of control. Because of buoyancy, spherical flames cannot be created in Earth s gravity. DESI was conceived by principal investigator Professor R.L. Axelbaum of Washington University in St. Louis. Tests to date have utilized the 2.2-Second Drop Tower at the NASA Glenn Research Center at Lewis Field. The experiment is slated for testing aboard the International Space Station in a few years. Two mechanisms have been proposed to explain the connection between nitrogen exchange and permanently blue flames. These are the structure (chemical effects) and hydrodynamics (flow direction and speed). In normal-gravity flames, the structure and hydrodynamics are coupled, since nitrogen exchange simultaneously modifies both. Spherical microgravity flames, on the other hand, allow independent control of these factors. Specifically, structure can be modified via nitrogen exchange, and flow direction can be reversed by swapping the ambient and burner-feed gases. In DESI, these variations can be accomplished without changing the theoretical flame temperature.

Author

Diffusion Flames; Soot; Extinguishing; Combustion Products

20050195863 DYNACS Engineering Co., Inc., USA, NASA Glenn Research Center, Cleveland, OH, USA
Atomic Oxygen Interactions With Silicone Contamination on Spacecraft in Low Earth Orbit Studied
Banks, Bruce A.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Silicones have been widely used on spacecraft as potting compounds, adhesives, seals, gaskets, hydrophobic surfaces, and atomic oxygen protective coatings. Contamination of optical and thermal control surfaces on spacecraft in low Earth orbit (LEO) has been an ever-present problem as a result of the interaction of atomic oxygen with volatile species from silicones and hydrocarbons onboard spacecraft. These interactions can deposit a contaminant that is a risk to spacecraft performance because it can form an optically absorbing film on the surfaces of Sun sensors, star trackers, or optical components or can increase the solar absorptance of thermal control surfaces. The transmittance, absorptance, and reflectance of such contaminant films seem to vary widely from very transparent SiOx films to much more absorbing SiOx-based films that contain hydrocarbons. At the NASA Glenn Research Center, silicone contamination that was oxidized by atomic oxygen has been examined from LEO spacecraft (including the Long Duration Exposure Facility and the Mir space station solar arrays) and from ground laboratory LEO simulations. The findings resulted in the development of predictive models that may help explain the underlying issues and effects. Atomic oxygen interactions with silicone volatiles and mixtures of silicone and hydrocarbon volatiles produce glassy SiOx-based contaminant coatings. The addition of hydrocarbon volatiles in the presence of silicone volatiles appears to cause much more absorbing (and consequently less transmitting) contaminant films than when no hydrocarbon volatiles are present. On the basis of the LDEF and Mir results, conditions of high atomic oxygen flux relative to low contaminant flux appear to result in more transparent contaminant films than do conditions of low atomic oxygen flux with high contaminant flux. Modeling predictions indicate that the deposition of contaminant films early in a LEO flight should depend much more on atomic oxygen flux than it does later in a mission.
Author
Contamination; Low Earth Orbits; Oxygen Atoms; Silicones

20050195872 NASA Glenn Research Center, Cleveland, OH, USA
Bubbly Suspension Generated in Low Gravity
Nahra, Henry K.; Research and Technology 1999; March 2000; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Bubbly suspensions are crucial for mass and heat transport processes on Earth and in space. These processes are relevant to pharmaceutical, chemical, nuclear, and petroleum industries on Earth. They are also relevant to life support, in situ resource utilization, and propulsion processes for long-duration space missions such as the Human Exploration and Development of Space program. Understanding the behavior of the suspension in low gravity is crucial because of factors such as bubble segregation, which could result in coalescence and affect heat and mass transport. Professors A. Sangani and D. Koch, principal investigators in the Microgravity Fluid Physics Program managed by the NASA Glenn Research Center at Lewis Field, are studying the physics of bubbly suspension. They plan to shear a bubbly suspension in a couette cell in microgravity to study bubble segregation and compare the bubble distribution in the couette gap with the one predicted by the suspension-averaged equations of motion. Prior to the Requirement Definition Review of this flight experiment, a technology for generating a bubbly suspension in microgravity has to be established, tested, and verified.
Derived from text
Bubbles; Solid Suspensions; Microgravity; Experiment Design

20050195890 NASA Glenn Research Center, Cleveland, OH, USA
Effect of Air and Vacuum Storage on the Degradation of X-Ray-Exposed Aluminized-Teflon Investigated
deGroh, Kim K.; Gummow, Jonathan D.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Metalized Teflon FEP (fluorinated ethylene propylene, DuPont), a common thermal control material, has been found to degrade in the low-Earth-orbit space environment. The aluminized-FEP (Al-FEP) exterior layer on the Hubble Space Telescope has become extremely embrittled, with extensive cracking occurring on all sides of the telescope. This embrittlement has been primarily attributed to radiation exposure (x-rays from solar flares, electron/proton radiation, and possibly near-ultraviolet radiation) combined with thermal cycling. Limited samples of FEP tested after long-term exposure to low Earth orbit on the Hubble Space Telescope and on the Long Duration Exposure Facility indicated that there might be continued degradation in tensile properties over time. An investigation was conducted at the NASA Glenn Research Center to evaluate the effect of air and vacuum storage on the mechanical properties of x-ray-exposed FEP. Aluminized-FEP (5-mil-thick) tensile samples were x-ray exposed with 15.3-kV copper xrays for 2 hr, reducing the percent elongation to failure

by approximately 50 percent in comparison to that for pristine Al-FEP. X-ray-exposed samples were stored in air or under vacuum for various time periods to see the effect of storage on tensile properties. Tensile results indicated that samples stored in air had larger decreases in tensile properties than samples stored under vacuum had, as seen in the graph. Samples stored under vacuum (for up to 400 hr) showed no further decrease in tensile properties over time, whereas samples stored in air (for up to 900 hr) appeared to show decreases in tensile properties over time. X-ray-exposed samples stored in air developed a hazy appearance in the exposed area, as seen in the photographs. When the source of the haziness was evaluated using scanning electron microscopy and atomic force microscopy, it was found to reside at the Al/FEP interface as witnessed by an increased surface roughness of the aluminized side of the material and a dramatic decrease in the adhesion between the Al and FEP. Optical properties of air-stored irradiated samples showed an increase in the diffuse reflectance, which is consistent with observed roughening that was characterized by AFM. These findings indicate that air exposure helps degrade x-ray-irradiated FEP. These results indicate that proper sample handling and storage is necessary with space-retrieved materials and with those exposed to ground-based irradiation simulation exposures.
Author
Aluminum; Degradation; Teflon (Trademark); Vacuum; Air; X Ray Irradiation

20050195965 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Numerical Analysis and Optimization of the Ultra Compact Combustor
Greenwood, Roger T.; Mar. 2005; 99 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434747; AFIT/GAE/ENY/05-M10; No Copyright; Avail: Defense Technical Information Center (DTIC)
In an effort to increase thrust per weight ratio and decrease pollutant emissions of aero-turbine jet engines, a circumferentially burning Ultra Compact Combustor (UCC) with a Cavity-in-a-Cavity design has been developed. A numerical analysis of this design has been conducted and compared with experimental results. The CFD model has been validated through a wide range of conditions and four alternative physical configurations of the UCC have been modeled. Emissions, combustor efficiencies, temperature and velocity profiles, and pressure drop values were used as comparison parameters. Numerical results indicate that increasing the outflow area will increase the pressure drop over the combustor and decrease the combustor efficiency. A significant decrease (250%) in the cavity circumferential velocity effectively decreased the fuel-air mixing in the cavity resulting in decreased combustion efficiencies. A decreased cavity length reduced combustor pressure drop significantly with only minimal increases in pollutant emissions. The addition of a curved vane to the decreased cavity length configuration further decreased the pressure drop.
DTIC
Combustion Chambers; Numerical Analysis

20050196083 Army Engineer Research and Development Center, Vicksburg, MS USA
Variations in Field-Scale Nitrogen and Phosphorus Concentrations in Runoff as a Function of Land-Use Practice
James, William F.; Eakin, Harry L.; Ruiz, Carlos E.; Barko, John W.; Sep. 2004; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434933; ERDC/TN SMART-04-8; No Copyright; Avail: Defense Technical Information Center (DTIC)
The purpose of this research was to examine nitrogen and phosphorus concentrations in runoff at the field-scale level (i.e., homogeneous land-use plot) over a variety of land-use practices. Land-use practices included animal containment/barnyard areas, corn production fields, alfalfa and grass hayfields, Conservation Reserve Program (CRP) fields, and woodlots located in the upper Eau Galle River Watershed, west-central Wisconsin. The watershed is dominated by agricultural and dairy livestock land-use practices. Results from this study will be important in improving watershed modeling capabilities for predicting the runoff of nutrients from complex landscape mosaics.
DTIC
Drainage; Land Use; Nitrogen; Phosphorus

20050196128 Air Force Research Lab., Edwards AFB, CA USA
Polyazide Chemistry. Preparation and Characterization of the First Binary Group 6 Azides, Mo(N3)6, W(N3)6, Mo(N3)7- and W(N3)7- and the NW(N3)4- and NMo(N3)4- Ions
Haiges, Ralf; Boatz, Jerry A.; Bau, Robert; Schneider, Stefan; Schroer, Thorsten; Yousufuddin, Muhammed; Christe, Karl O.; Nov. 2004; 6 pp.; In English
Contract(s)/Grant(s): Proj-DARP
Report No.(s): AD-A435000; No Copyright; Avail: Defense Technical Information Center (DTIC)

Whereas numerous binary transition-metal azido complexes have been reported,1 no binary Group 6 azides are known. Only a limited number of partially azide-substituted molybdenum and tungsten compounds have been reported. Furthermore, no heptaazido compounds have been described. Herein, we report the synthesis and characterization of the first binary Group 6 azides, Mo(N3)6, W(N3)6, Mo(N3)7-, and W(N3)7-. The last two ions represent the first examples of heptaazides. We also report the crystal structure of W(N3)6 and the controlled nitrogen loss from the heptaazido anions to give nitrido-teraazido anions. The NMo(N3)4- ion is already known but had been obtained by a different method.
DTIC
Azides (Inorganic); Azides (Organic); Binary Mixtures; Chemical Properties; Ions

20050196143 Air Force Research Lab., Edwards AFB, CA USA
An Innovative Ignition Method Using SWCNTs and a Camera Flash
Danczyk, Stephen A.; Chehroudi, Bruce; Feb. 2005; 5 pp.; In English
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A435024; No Copyright; Avail: Defense Technical Information Center (DTIC)
This paper describes an ignition method that uses a simple camera flash and single-walled carbon nanotubes (SWCNTs) to ignite various fuels. This method has been used to ignite both solid and liquid fuels. The effects of iron (Fe) nanoparticles (embedded in the SWCNTs) concentration on the ignition process have been studied. The application of this nano-technology based ignition method may also be extended to achieve distributed ignition that would allow ignition in numerous locations simultaneously.
DTIC
Cameras; Carbon Nanotubes; Ignition

20050196727 NASA Glenn Research Center, Cleveland, OH, USA
A Comparison Study: The New Extended Shelf Life Isopropyl Ester PMR Technology versus The Traditional Methyl Ester PMR Approach
Alston, William B.; Scheiman, Daniel A.; Sivko, Gloria S.; [2005]; 39 pp.; In English
Contract(s)/Grant(s): WBS 22-714-30-01
Report No.(s): E-15194; No Copyright; Avail: CASI; A03, Hardcopy
Polymerization of Monomeric Reactants (PMR) monomer solutions and carbon cloth prepregs of PMR II-50 and VCAP-75 were prepared using both the traditional limited shelf life methanol based PMR approach and a novel extended shelf life isopropanol based PMR approach. The methyl ester and isopropyl ester based PMR monomer solutions and PMR prepregs were aged for up to four years at freezer and room temperatures. The aging products formed were monitored using high pressure liquid chromatography (HPLC). The composite processing flow characteristics and volatile contents of the aged prepregs were also correlated versus room temperature storage time. Composite processing cycles were developed and six ply cloth laminates were fabricated with prepregs after various extended room temperature storage times. The composites were then evaluated for glass transition temperature (Tg), thermal decomposition temperature (Td), initial flexural strength (FS) and modulus (FM), long term (1000 hours at 316 C) thermal oxidative stability (TOS), and retention of FS and FM after 1000 hours aging at 316 C. The results for each ester system were comparable. Freezer storage was found to prevent the formation of aging products for both ester systems. Room temperature storage of the novel isopropyl ester system increased PMR monomer solution and PMR prepreg shelf life by at least an order of magnitude while maintaining composite properties.
Author
Esters; Isopropyl Compounds; Monomers; Polymerization; Technologies; Life (Durability); Methyl Compounds; Fabrication

20050196751 California Univ., Berkeley, CA, USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Effect of Secondary Structure on the Interactions of Peptide T4 LYS(11-36) in Mixtures of Aqueous Sodium Chloride and 2,2,2-Trifluorethanol
Anderson, C. O.; Spiegelberg, S.; Prausnitz, J. M.; Blanch, H. W.; January 2005; 38 pp.; In English
Report No.(s): DE2005-837230; No Copyright; Avail: Department of Energy Information Bridge
The potential of mean force for protein-protein interactions is key to the development of a statistical-mechanical model for salt-induced protein precipitation and crystallization, and for understanding certain disease states, including cataract formation and (beta)-amyloid pathology in Alzheimer's disease. Fluorescence anisotropy provides a method for quantitative characterization of intermolecular interactions due to reversible association. Monomer-dimer equilibria for the peptide T4

LYS(11-36) were studied by fluorescence anisotropy. This peptide, derived from the (beta)-sheet region of the T4 lysozyme molecule, has the potential to form amyloid fibrils. 2,2,2-trifluoroethanol (TFE) induces a change in peptide secondary structure, and was used in aqueous solutions at concentrations from 0 to 50% (v/v) at 25 and 37 C to examine the role of peptide conformation on peptide-peptide interactions. The association constant for dimerization increased with rising TFE concentration and with falling temperature. The peptide-peptide potential of mean force was computed from these association constants. Circular-dichroism measurements showed that the secondary structure of the peptide plays an important role in these strong attractive interactions due to intermolecular hydrogen-bond formation and hydrophobic interactions.
NTIS
Peptides; Sodium Chlorides; Aqueous Solutions

20050196765 Fire Administration, Washington, DC, USA
Smoke Alarm Performance in Residential Structure Fires. U.S. Fire Administration Topical Fire Research Series, Volume 1, Issue 15, March 2001. (Rev. December 2001)
Dec. 2001; 10 pp.; In English
Report No.(s): PB2005-107973; No Copyright; Avail: CASI; A02, Hardcopy

Each year, there are an estimated 405,000 fires in residential structures, which cause nearly 3,600 fatalities, 18,600 injuries, and $4.7 billion in property loss. Given the enormity of the U.S. fire problem, fire service and public health experts are constantly seeking programs/devices that will reduce the number of lives lost and property destroyed by fire. Since 1970 when battery-powered smoke alarms were first introduced, smoke alarms have become a familiar presence in American homes. By 2000, they were installed in nearly 94% of U.S. households. This topical report examines the performance of smoke alarms in residential structure fires. Particular attention is given to fatal fires, especially those with multiple victims.
NTIS
Fires; Smoke; Warning Systems

20050196777 Lawrence Livermore National Lab., Livermore, CA USA
NADS-Nuclear and Atomic Data System
McKinley, M. S.; Beck, B.; McNabb, D.; Sep. 22, 2004; 10 pp.; In English
Report No.(s): DE2005-15014413; UCRL-CONF-206718; No Copyright; Avail: Department of Energy Information Bridge

We have developed NADS (Nuclear and Atomic Data System), a web-based graphical interface for viewing point wise and grouped cross-sections and distributions. Our implementation is a client/server model. The client is a Java applet that displays the graphical interface, which has interactive 2-D, 3-D, and 4-D plots and tables. The server, which can serve and perform computations the data, has been implemented in Python using the FUDGE package developed by Bret Beck at LLNL. Computational capabilities include algebraic manipulation of nuclear evaluated data in databases such as LLNL's ENDL-99, ENDF/B-V and ENDF/B-VI as well as user data. Processed data used in LLNL's transport codes are accessible as well.
NTIS
Atoms; Data Systems; Graphical User Interface

20050196779 Alabama Univ., Tuscaloosa, AL, USA
Novel Fission-Product Separation Based on Room-Temperature Ionic Liquids. (Report for September 15, 2001-September 14, 2004)
Dec. 2004; 18 pp.; In English
Report No.(s): DE2005-835018; No Copyright; Avail: Department of Energy Information Bridge

This project has demonstrated that Sr2+ and Cs+ can be selectively extracted from aqueous solutions into ionic liquids using crown ethers and that unprecedented large distribution coefficients can be achieved for these fission products. The volume of secondary wastes can be significantly minimized with this new separation technology. Through the current EMSP funding, the solvent extraction technology based on ionic liquids has been shown to be viable and can potentially provide the most efficient separation of problematic fission products from high level wastes. The key results from the current funding period are the development of highly selective extraction process for cesium ions based on crown ethers and calixarenes, optimization of selectivities of extractants via systematic change of ionic liquids, and investigation of task-specific ionic liquids incorporating both complexant and solvent characteristics.
NTIS
Fission Products; Liquids; Radioactive Wastes; Waste Management

20050196786 Lawrence Livermore National Lab., Livermore, CA USA

Development of a Detailed Chemical Kinetic Mechanism for Disobutylene and Comparison to Shock Tube Ignition Times

Metcalfe, W.; Curran, H. J.; Simmie, J. M.; Pitz, W. J.; Westbrook, C. K.; Jan. 25, 2005; 12 pp.; In English

Report No.(s): DE2005-15011577; UCRL-CONF-209210; No Copyright; Avail: Department of Energy Information Bridge

There is much demand for chemical kinetic models to represent practical fuels such as gasoline, diesel and aviation fuel. These blended fuels contain hundreds of components whose identity and amounts are often unknown. A chemical kinetic mechanism that would represent the oxidation of all these species with accompanying chemical reactions is intractable with current computational capabilities, chemical knowledge and manpower resources. The use of surrogate fuels is an approach to make the development of chemical kinetic mechanisms for practical fuels tractable. A surrogate fuel model consists of a small number of fuel components that can be used to represent the practical fuel and still predict desired characteristics of the practical fuel. These desired fuel characteristics may include ignition behavior, burning velocity, fuel viscosity, fuel vaporization, and fuel emissions (carbon monoxide, hydrocarbons, soot and nitric oxides). Gasoline consists of many different classes of hydrocarbons including n-alkanes, alkenes, iso-alkanes, cycloalkanes, cycloalkenes, and aromatics. One approach is to use a fuel surrogate that has a single component from each class of hydrocarbon in gasoline so that the unique molecular structure of each class is represented. This approach may lead to reliable predictions of many of the combustion properties of the practical fuel. In order to obtain a fuel surrogate mechanism, detailed chemical kinetic mechanisms must be developed for each component in the surrogate. In this study, a detailed chemical kinetic mechanism is developed for disobutylene, a fuel intended to represent alkenes in practical fuels such as gasoline, diesel, and aviation fuel.

NTIS

Chemical Reactions; Ignition; Reaction Kinetics; Shock Tubes

20050196801 Lawrence Livermore National Lab., Livermore, CA USA

Engineering Design and Testing of a Ground Water Remediation System Using Electrolytically Generated Hydrogen with a Palladium Catalyst for Dehalogenation of Chlorinated Hydrogen

Ruiz, R.; McNab, W. W.; Dec. 1997; 20 pp.; In English

Report No.(s): DE2005-16590; UCRL-JC-128828; No Copyright; Avail: Department of Energy Information Bridge

Recent studies have shown that dissolved hydrogen causes rapid dehalogenation of chlorinated hydrocarbons in the presence of a palladium catalyst. The speed and completeness of these reactions offer advantages in designing remediation technologies for certain ground water contamination problems. However, a practical design challenge arises in the need to saturate the aqueous phase with hydrogen in an expeditious manner. To address this issue, a two-stage treatment reactor has been developed. The first stage consists of an electrolytic cell that generates hydrogen by applying a voltage potential across the influent water stream. The second stage consists of a catalyst column of palladium metal supported on alumina beads. A bench-scale reactor has been used to test this design for treating ground water contaminated with trichloroethene and other chlorinated hydrocarbons. In influent streams containing contaminant concentrations up to 4 ppm, initial results confirm that destruction efficiencies greater than 95% may be achieved with residence times short enough to allow practical implementation in specially designed flow-through treatment wells. Results from the bench-scale tests are being used to design a pilot ground water treatment system.

NTIS

Catalysts; Chlorination; Ground Water; Hydrogen; Palladium; Water; Water Pollution

20050198869 NASA Glenn Research Center, Cleveland, OH, USA

Synthesis, Characterization, and Optical Properties of a Cyano-Functionalized 4,5,9,10-tetraaryl-l,6-dioxapyrene

Tyson, Daniel S.; Fabrizio, Eve F.; Panzner, Matthew J.; Kinder, James D.; Buisson, Jean-Pierre; Christensen, Jorn B.; Meador, Michael A.; [2004]; 23 pp.; In English

Contract(s)/Grant(s): NCC3-1089; WBS 22-708-87-09-04

Report No.(s): E-14861; Copyright; Avail: CASI; A03, Hardcopy

5,10-Di(4-cyanophenyl)-4,9-di(4-methylphenyl)-1,6-dioxapyrene (CN-diox), a symmetrically substituted 4,5,9,10-tetraaryldioxapyrene, was synthesized in seven steps from 1,4-dihydroxynaphthalene. The synthetic methodology incorporated a base-catalyzed ring-closure process followed by dehydration to introduce the first tetraaryl- 1,6-dioxapyrene. Crystal structure and electrochemical analysis were performed to directly compare the properties of CN-diox to previously reported dioxapyrene derivatives, specifically 1,6-dioxapyrene (Diox) and 4,9-diethyl-2,7-dimethyl- 1,6-dioxapyrene (Alkyl-diox). Optical spectroscopy studies were performed to evaluate the potential of the 1,6-dioxapyrenes as fluorescent probes. CN-diox revealed a broad absorption centered near 450 nm (epsilon = 31,900/M/cm) in THF with a corresponding

fluorescence at 619 nm (Phi(sub f) = 0.011). This was in sharp contrast to both Diox and Alkyl-diox which displayed broad absorption bands near 400 nm (epsilon approx. 5,000-10,000/M/cm) in THF with corresponding fluorescence near 500 nm (Phi(sub f) = 0.059 and 0.082 for Diox and Alkyl-diox, respectively). The luminescence of CN-diox was found to be solvatochromic (lambda(sub max) = 619 nm-644 nm) with single exponential lifetimes of less than 1.3 ns. Neither Diox nor Alkyl-diox showed solvatochromic properties.
Author
Synthesis (Chemistry); Optical Properties; Cyano Compounds; Fluorescence; Pyrenes; Luminescence

20050198872 NASA Langley Research Center, Hampton, VA, USA
Prediction of Mechanical Properties of Polymers With Various Force Fields
Odegard, Gregory M.; Clancy, Thomas C.; Gates, Thomas S.; [2005]; 12 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA
Contract(s)/Grant(s): NCC1-02043; NNL04AA85G; 23-762-55-LC; Copyright; Avail: CASI; A03, Hardcopy

The effect of force field type on the predicted elastic properties of a polyimide is examined using a multiscale modeling technique. Molecular Dynamics simulations are used to predict the atomic structure and elastic properties of the polymer by subjecting a representative volume element of the material to bulk and shear finite deformations. The elastic properties of the polyimide are determined using three force fields: AMBER, OPLS-AA, and MM3. The predicted values of Young s modulus and shear modulus of the polyimide are compared with experimental values. The results indicate that the mechanical properties of the polyimide predicted with the OPLS-AA force field most closely matched those from experiment. The results also indicate that while the complexity of the force field does not have a significant effect on the accuracy of predicted properties, small differences in the force constants and the functional form of individual terms in the force fields determine the accuracy of the force field in predicting the elastic properties of the polyimide.
Author
Polyimides; Field Theory (Physics); Modulus of Elasticity

20050198873 NASA Glenn Research Center, Cleveland, OH, USA
Diels-Alder Trapping of Photochemically Generated o-Quinodimethane Intermediates: An Alternative Route to Photocured Polymer Film Development
Tyson, Daniel S.; Ilhan, Faysal; Meador, Mary Ann B.; Smith, Dee Dee; Scheiman, Daniel A.; Meador, Michael A.; [2004]; 28 pp.; In English
Contract(s)/Grant(s): NCC3-887; NCC3-1089
Report No.(s): E-14863; Copyright; Avail: CASI; A03, Hardcopy

Photolysis of o-methylphenyl ketones generates bis-o-quinodimethane intermediates that can be trapped in situ by dienophiles through Diels-Alder cycloadditions. This well-known photochemical process is applied to a series of six new photoreactive monomers containing bis-(o-methylphenyl ketone) functionalities combined with diacrylate and triacrylate ester monomers for the development of acrylic ester copolymer blends. Irradiation of cyclohexanone solutions of the bis-(o-methylphenyl ketone)s and acrylate esters produce thin polymer films. Solid state 13C NMR data indicated 47- 100% reaction of the bis-(o-methylphenyl ketone)s, depending on experimental conditions, to yield the desired products. DSC and TGA analyses were performed to determine the glass transition temperature, T,, and onset of decomposition, Td, of the resulting polymer films. A statistical Design of Experiments approach was used to obtain a systematic understanding of the effects of experimental variables on the extent of polymerization and the final polymer properties.
Derived from text
Diels-Alder Reactions; Acrylates; Photochemical Reactions

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METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20050188690 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Biaxial Fatigue Behavior of Niti Shape Memory Alloy
Jensen, Daniel M.; Mar. 2005; 101 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434348; AFIT/GA/ENY/05-M06; No Copyright; Avail: Defense Technical Information Center (DTIC)

Nitinol is a shape memory alloy (SMA) capable of martensite-to-austenite phase transformations enabling shape-memory

behavior. Shape-memory properties make Nitinol a strong candidate material for use in aircraft applications such as actuators. Structural integrity and reliability of torque tube actuators must be assured before this material can be used in flight-critical components. Thorough understanding of the fatigue response of the material is essential for a structurally-sound SMA actuator design. The present effort investigates pure torsion and combined tension-torsion fatigue behavior of Nitinol at room temperature. Monotonic tests in tension and torsion were conducted to typify uni-directional stress-strain behavior. Fully-reversed torsion fatigue tests were conducted with shear stress ranges of 416, 584, 674, and 1310 MPa. In fully-reversed biaxial fatigue tests, a shear stress range of 500 MPa was superimposed on the axial stress ranges of 250, 500, 1000, 1120, and 1500 MPa. Fatigue behavioral characteristics, including fatigue S-N curves were established. Fatigue lives obtained in torsion-dominated biaxial tests were similar to those obtained in pure torsion. Conversely, tension-dominated biaxial fatigue was significantly more damaging, resulting in decreased fatigue lives. Applicability of von Mises criterion to correlating uniaxial and biaxial test results was examined. Evolution of stress-strain behavior with cycling is discussed.
DTIC
Binary Alloys; Metal Fatigue; Nickel Alloys; Shape Memory Alloys; Titanium Alloys

20050188724 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Application of Functionally Graded Materials in Aircraft Strutures
Cooley, William G.; Mar. 2005; 189 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434403; AFIT/GAE/ENY/05-M04; No Copyright; Avail: CASI; A09, Hardcopy

A Functionally Graded Material (FGM) is a material which has a continuous variation of material properties through-the-thickness. This thesis will explore analysis of FGM flat plates and shell panels, and use FGM's unique characteristics to retrofit a cracked exhaust wash structure. FGMs are first characterized as flat plates under pressure and thermal loading. Next, FGM shell panels are characterized under thermal loading. Conclusions drawn from FGM characterization are used to develop a patch to retrofit a cracked aircraft exhaust wash structure. The exhaust wash structure is first analyzed to provide a baseline and then several FGM patches are evaluated on their ability to reduce stress and deflection. Finally, an exhaust wash panel made of FGM is analyzed.
DTIC
Exhaust Gases; Functionally Gradient Materials; Retrofitting

20050192566 Lawrence Livermore National Lab., Livermore, CA USA
Transformation Crystallography and Plasticity of the Delta to Alpha Prime Transformation in Plutonium Alloys
Krenn, C. R.; Wall, M. A.; Schwartz, A. J.; Dec. 22, 2003; 12 pp.; In English
Report No.(s): DE2005-15013846; UCRL-CONF-201578; No Copyright; Avail: Department of Energy Information Bridge

In delta phase Pu-Ga alloys, the transformation from the ductile face-centered cubic (fcc) alpha prime phase that is retained at room temperature to the brittle low-temperature monoclinic alpha prime phase is a thermally activated diffusionless transformation with double-c kinetics. Accurate modeling of the phase transformation requires detailed understanding of the role of plastic flow during the transformation and of the crystallographic transformation path. Using transmission electron microscopy (TEM), we find a significant increase in dislocation density in delta near the alpha prime plates, which suggests that plastic deformation contributes to the accommodation of the 20% reduction in volume during the transformation.
NTIS
Crystallography; Phase Transformations; Plastic Properties; Plutonium Alloys; Plastic Deformation; Gallium Alloys

20050194598 Argonne National Lab., IL, USA
Metal Waste Form Corrosion Release Data from Immersion Tests
January 2005; 510 pp.; In English
Report No.(s): DE2005-837433; ANL-04/15; No Copyright; Avail: Department of Energy Information Bridge

The compilation of Metal Waste Form (MWF) immersion test data in this document is part of the effort initiated to qualify the stainless steel-15% zirconium (SS-15Zr) alloy for repository disposal. The SS-15Zr alloy was developed as part of the waste stream from the Argonne National Laboratory (ANL) electrometallurgical process for spent nuclear fuel. There were four areas of significant relevance concerning MWF performance in a long-term repository setting addressed in the test model. The areas encompassed the study of the effects of: (1) the solution aggressiveness (simulated by concentrated J13 solution (CJ13)), (2) high-chloride content of the solution (simulated by 10,000 ppm chloride solution (10KCl)), (3) solution pH (simulated by acidified J13 solution (AJ13)), and (4) the state of the metal surface--polished vs. oxidized on the releases. The simulated J-13 solution was intended to replicate the groundwater in the J-13 well at the Yucca Mountain geologic repository.

A fifth area of interest was to determine if the releases were limited by iron saturation of the solution. The data obtained from the entire study will be compared with the data from the High Level Waste Glass (HLWG) form previously qualified for repository disposal. Even though the MWF samples used in these tests contained no actinides and no Tc, conclusions can be made with respect to the releases of the noble metal fission products and the stainless steel constituents. Fe releases are an order of magnitude or higher than the releases of the noble metal fission-product elements in all solutions. Releases of noble metal fission products and Cr and Ni in SJ13 and CJ13 solutions at 90 C are close to the limits of detection. Solution concentration increased the Zr release. Zr releases from CJ13 were about a factor of 2 lower than the Fe release. In CJ13, Zr releases from oxidized samples were higher than from polished samples. Releases of all elements increased in the AJ13, pH=2 solution. Total cumulative releases as a function of time continued to increase for the 308 days of tests unlike the behavior in other test solutions. Tests in solutions with pH between 2 and 8 are needed to understand the different behavior. Except for high chloride solutions, (10KCl), release rates of stainless steel elements and noble metal fission products from the MWF samples are lower than release rates from HLWG.
NTIS
Corrosion; Submerging; Zirconium Alloys

20050194610 Department of Energy, Washington, DC USA
Dissolution of Fe(III)(hydr) by an Aerobic Bacterium
January 2005; 12 pp.; In English
Report No.(s): DE2005-837302; No Copyright; Avail: Department of Energy Information Bridge

This project investigated the effects of an aerobic Pseudomonas mendocina bacterium on the dissolution of Fe(III)(hydr)oxides. The research is important because metals and radionuclides that adsorb to Fe(III)(hydr)oxides could potentially be remobilized by dissolving bacteria. We showed that P. mendocina is capable of dissolving Fe-bearing minerals by a variety of mechanisms, including production of siderophores, pH changes, and formation of reductants. The production of siderophores by P. mendocina was quantified under a variety of growth conditions. Finally, we demonstrated that microbial siderophores may adsorb to and enhance dissolution of clay minerals.
NTIS
Aerobes; Bacteria; Dissolving; Hydroxides; Iron Oxides

20050194634 Bettis Atomic Power Lab., West Mifflin, PA, USA
Effect of Thermo-Mechanical Processing on the Mechanical Properties of Molybdenum, Volume 2
Mueller, A. J.; Shields, J. A.; Buckman, R. W.; January 2005; 16 pp.; In English
Report No.(s): DE2005-835081; B-T-3325-Vol-2; No Copyright; Avail: Department of Energy Information Bridge

Variations in oxide species and consolidation method have been shown to have a significant effect on the mechanical properties of oxide dispersion strengthened (ODS) molybdenum material. The mechanical behavior of molybdenum - 2 Volume % La(sub)2O(sub)3 mill product forms, produced by a wet doping process, were characterized over the temperature range of -150 degrees C to 1800 degrees C. The various mill product forms evaluated ranged from thin sheet stock to bar stock. Tensile properties of the material in the various product forms were not significantly affected by the vast difference in total cold work. Creep properties, however, were sensitive to the total amount of cold work as well as the starting microstructure. Stress-relieved material had superior creep rupture properties to recrystallized material at 1200 degrees C, while at 1500 degrees C and above the opposite was observed. Thus it is necessary to match the appropriate thermo-mechanical processing and microstructure of molybdenum - 2 volume % LA(sub)2O(sub)3 to the demands of the application being considered.
NTIS
Lanthanum Oxides; Molybdenum; Thermodynamics; Tensile Properties

20050194679 Lawrence Livermore National Lab., Livermore, CA USA
Micron-Scale MIC of Alloy 22 After Long Term Incubation in Saturated Nuclear Waste Respository Microcosms
Martin, S.; Horn, J.; Carrillo, C.; Oct. 29, 2003; 18 pp.; In English
Report No.(s): DE2005-15014418; UCRL-CONF-200650; No Copyright; Avail: Department of Energy Information Bridge

The effects of potential microbiologically influenced corrosion (MIC) on candidate packaging materials for nuclear waste containment are being assessed. Coupons of Alloy 22, the outer barrier candidate for waste packaging, were exposed to a simulated, saturated repository environment consisting of crushed rock from the repository site and a continual flow of simulated groundwater for periods up to five years. Coupons were incubated with YM tuff under both sterile and non-sterile conditions. Surfacial analysis of the biotically-incubated coupons show development of both submicron-sized pinholes and

pores; these features were not present on either sterile or untreated control coupons. Quantification of these effects will help define the overall contribution of MIC to the integrity of the containment system over a period of 10,000 years.
NTIS
Packaging; Radioactive Wastes; Waste Disposal; Corrosion; Microbiology; Alloys

20050194681 Lawrence Livermore National Lab., Livermore, CA USA
Influence of the Environment on the General Corrosion Rate of Alloy 22 (N06022)
Rebak, R. B.; Crook, P.; Apr. 20, 2004; 14 pp.; In English
Report No.(s): DE2005-15014113; UCRL-OROC-203671; No Copyright; Avail: Department of Energy Information Bridge

Nickel (Ni) can dissolve a large amount of alloying elements while still maintaining its desirable austenitic microstructure. The resulting alloys are generally divided in families depending on the type of alloying elements they contain. Each one of these families is aimed to specific applications. Corrosive environments in industrial applications are generally divided for example in reducing acids, oxidizing acids, contaminated acids, caustic environments, oxidizing salts, etc. Depending on the application and the environment (electrolyte composition and temperature) several or single alloys may be recommended to fabricate components. The Ni-chromium-molybdenum series contains a balanced selection of beneficial alloying elements so it can handle a variety of aggressive environments. By design, Alloy 22 or N06022 is one of the most versatile corrosion resistant nickel alloys since it has an outstanding corrosion resistance both in reducing and oxidizing conditions.
NTIS
Corrosion; Nickel Alloys

20050195865 QSS Group, Inc., USA
New Screening Test Developed for the Blanching Resistance of Copper Alloys
Thomas-Ogbuji, Linus U.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

NASA's extensive efforts towards more efficient, safer, and more affordable space transportation include the development of new thrust-cell liner materials with improved capabilities and longer lives. For rocket engines fueled with liquid hydrogen, an important metric of liner performance is resistance to blanching, a phenomenon of localized wastage by cycles of oxidation-reduction due to local imbalance in the oxygen-fuel ratio. The current liner of the Space Shuttle Main Engine combustion chamber, a Cu-3Ag-0.5Zr alloy (NARloy-Z) is degraded in service by blanching. Heretofore, evaluating a liner material for blanching resistance involved elaborate and expensive hot-fire tests performed on rocket test stands. To simplify that evaluation, researchers at the NASA Glenn Research Center developed a screening test that uses simple, in situ oxidation-reduction cycling in a thermogravimetric analyzer (TGA). The principle behind this test is that resistance to oxidation or to the reduction of oxide, or both, implies resistance to blanching. Using this test as a preliminary tool to screen alloys for blanching resistance can improve reliability and save time and money. In this test a small polished coupon is hung in a TGA furnace at the desired (service) temperature. Oxidizing and reducing gases are introduced cyclically, in programmed amounts. Cycle durations are chosen by calibration, such that all copper oxides formed by oxidation are fully reduced in the next reduction interval. The sample weight is continuously acquired by the TGA as usual.
Derived from text
Copper Alloys; Oxidation-Reduction Reactions; Oxidation Resistance; Rocket Linings; Thermogravimetry

20050196185 California Univ., Davis, CA USA
Mechanoelectrically Activated Synthesis of Dense, Bulk Nanostructured, Complex Crystalline and Glassy Hard Materials
Munir, Z. A.; Apr. 2005; 14 pp.; In English
Contract(s)/Grant(s): DAAD-19-01-1-0493
Report No.(s): AD-A435086; ARO-41580.2-MS; No Copyright; Avail: CASI; A03, Hardcopy

The broad objective of the completed work was to investigate the effect of mechanical and electric field activation on the synthesis and properties of materials, with special emphasis on nanostructured hard materials. We have investigated several aspects of this, including: (a) Synthesis and Microstructural Evolution under Field Application, (b) Synthesis of Bulk Nanostructured Materials by Mechanical and Field Activation, (c) Investigations on FGM Formation and Properties, (d) Investigations on the Field Activated Synthesis Complex and Hard Materials, (e) Modeling Studies, (f) Microalloying, (g) Field Activated Consolidation and Crystallization of Bulk Metallic Glasses, and (h) Synthesis of Ultra-Hard Boride Phases.

Brief descriptions of the accomplishments in each of these thrusts are provided, with details given in the cited publications listed at the end of this report.
DTIC
Crystallinity; Crystallization; Glass; Hardness

20050196210 Naval Postgraduate School, Monterey, CA USA
Study of Cavitation and Failure Mechanisms of a Superplastic 5083 Aluminum Alloy
Boydon, Juanito F., Jr; Sep. 2003; 87 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435116; No Copyright; Avail: Defense Technical Information Center (DTIC)

Superplastic forming of AA5083 is an economical way to create components of complex shape while retaining the high strength and stiffness-to-weight ratios associated with aluminum alloys. However, failure of the material due to formation and linkage of cavities during superplastic deformation poses a major obstacle in effective industrial employment of this technology. Deformed samples of AA5083 were analyzed by various techniques after superplastic deformation under uniaxial tension, biaxial tension, or plane strain conditions. The goal was to determine the roles of MnAl6 second phase particles and the grain boundary disorientations in the processes of cavity formation and growth. Scanning electron microscopy (SEM) techniques included backscatter imaging (BSI) , energy dispersive spectrometry (EDS) and orientation imaging microscopy (OIM) to identify and evaluate sites of cavity formation in these samples. Results of this study show that cavities form due to grain boundary sliding (GBS) and separation of boundaries. Second phase particles such as MnAl6 were apparent on some separating boundaries but not on others. Cavities also grow from pre-existing voids introduced during prior processing. The role of GBS was confirmed by evaluating the grain-to-grain disorientations across newly formed small cavities. Results show that these disorientations are greater than or equal to 7 degrees, a value consistent with the threshold value of disorientation for GBS in pure Aluminum.
DTIC
Aluminum Alloys; Cavitation Flow; Failure; Grain Boundaries; Sliding; Superplasticity

20050196243 North Carolina Univ., Wilmington, NC USA
Speciation, Fluxes, and Cycling of Dissolved Copper and Zinc in Estuaries: The Roles of Sediment Exchange and Photochemical Effects
Skrabal, Stephen A.; Rivera-Duarte, Ignacio; Jul. 2005; 105 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435180; No Copyright; Avail: Defense Technical Information Center (DTIC)

Copper (Cu) and zinc (Zn) have numerous sources in naval shipping, berthing, and maintenance facilities. Concentrations of these metals in estuaries and harbors can reach levels which are potentially toxic to biota. Hence, discharges and concentrations of these metals are strictly regulated by environmental quality agencies. Because of pervasive problems associated with discharges and remediation of Cu and Zn in estuaries and harbors, it is essential that regulated agencies and regulators alike understand the factors that influence the availability and cycling behavior of these metals in environments relevant to DoD operations.
DTIC
Copper; Cycles; Estuaries; Photochemical Reactions; Sediments; Zinc

20050196252 Industrial Coll. of the Armed Forces, Washington, DC USA
Spring 2004 Industry Study Final Report: Strategic Materials
Babus, Sylvia W.; Carlson, Tom A.; Jones, William F.; Boslego, David V.; Davis, Mark K.; Dion, Denis; Doryland, David J.; Harris, Mark W.; Hemmrich, Steven B.; Hollman, Karen A.; Jan. 2004; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435196; No Copyright; Avail: Defense Technical Information Center (DTIC)

Strategic materials are those materials and related technologies whose critical function or supply are essential to the economic competitiveness and security of the USA. Emerging materials and technologies are key enablers to military transformation and economic growth. The USA needs to continue to fund research and development and create an environment conducive to transitioning research to manufactured products. The 'Buy America' policy needs to be reviewed and the waiver process streamlined. A virtual strategic stockpile needs to be created and rare earth elements considered for stockpiling. The government must vigorously enforce the intellectual property rights of U.S. companies. While not a comprehensive study of all materials and technologies, this industry study focuses on several materials and emerging technologies that will play a significant role in ensuring the economic competitiveness and national security of the USA in the next two decades and beyond. Given the difficulty in defining the boundaries of the strategic materials 'industry,' the authors' purpose in this report

is to present an executive summary of several key materials and technologies in a global context. Specifically, this discussion will do the following: (1) define the industry; (2) evaluate its current condition, challenges, and outlook; (3) assess the industry's contribution to national security, the nation's competitive advantage, and transformation efforts; and (4) provide recommendations for Federal Government action.
DTIC
Economics; Forecasting; Industries; Policies; Security; Strategic Materials; United States

20050196553 NASA Glenn Research Center, Cleveland, OH, USA
Thermodynamics of Titanium-Aluminum-Oxygen Alloys Studied
Copland, Evan H.; Jacobson, Nathan S.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Titanium-aluminum alloys are promising intermediate-temperature alloys for possible compressor applications in gas-turbine engines. These materials are based on the a2-Ti3Al + g-TiAl phases. The major issue with these materials is high oxygen solubility in a2-Ti3Al, and oxidation of unsaturated alloys generally leads to mixed non-protective TiO2+Al2O3 scales. From phase diagram studies, oxygen saturated a2-Ti3Al(O) is in equilibrium with Al2O3; however, oxygen dissolution has a detrimental effect on mechanical properties and cannot be accepted. To better understand the effect of oxygen dissolution, we examined the thermodynamics of titanium-aluminum-oxygen alloys.
Derived from text
Thermodynamics; Titanium Alloys; Aluminum Oxides; Aluminum Alloys

20050196555 NASA Glenn Research Center, Cleveland, OH, USA
Improved Method Being Developed for Surface Enhancement of Metallic Materials
Gabb, Timothy P.; Telesman, Jack; Kantzos, Peter T.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Surface enhancement methods induce a layer of beneficial residual compressive stress to improve the impact (FOD) resistance and fatigue life of metallic materials. A traditional method of surface enhancement often used is shot peening, in which small steel spheres are repeatedly impinged on metallic surfaces. Shot peening is inexpensive and widely used, but the plastic deformation of 20 to 40 percent imparted by the impacts can be harmful. This plastic deformation can damage the microstructure, severely limiting the ductility and durability of the material near the surface. It has also been shown to promote accelerated relaxation of the beneficial compressive residual stresses at elevated temperatures. Low-plasticity burnishing (LPB) is being developed as an improved method for the surface enhancement of metallic materials. LPB is being investigated as a rapid, inexpensive surface enhancement method under NASA Small Business Innovation Research contracts NAS3-98034 and NAS3-99116, with supporting characterization work at NASA. Previously, roller burnishing had been employed to refine surface finish. This concept was adopted and then optimized as a means of producing a layer of compressive stress of high magnitude and depth, with minimal plastic deformation (ref. 1). A simplified diagram of the developed process is given in the following figure. A single pass of a smooth, free-rolling spherical ball under a normal force deforms the surface of the material in tension, creating a compressive layer of residual stress. The ball is supported in a fluid with sufficient pressure to lift the ball off the surface of the retaining spherical socket. The ball is only in mechanical contact with the surface of the material being burnished and is free to roll on the surface. This apparatus is designed to be mounted in the conventional lathes and vertical mills currently used to machine parts. The process has been successfully applied to nickel-base superalloys by a team from the NASA Glenn Research Center, Lambda Research, and METCUT Research, as supported by the NASA Small Business Innovation Research Phase I and II programs, the Ultra Safe program, and the Ultra- Efficient Engine Technology (UEET) Program.
Author
Metal Surfaces; Surface Finishing; Surface Properties; Impact Resistance; Fatigue Life; Heat Resistant Alloys; Plastic Deformation; Shot Peening

20050196556 Case Western Reserve Univ., Cleveland, OH, USA
GRCop-84 Developed for Rocket Engines
Ellis, David L.; Yun, Hee Man; Lerch, Bradley A.; Keller, Dennis A.; Holmes, Richard; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

GRCop-84 (Cu-8 at.% Cr-4 at.% Nb) was developed at the NASA Glenn Research Center for use in regeneratively cooled rocket engines. This alloy possesses an excellent combination of conductivity, thermal expansion, strength, creep resistance,

ductility, and low-cycle fatigue (LCF) life. In comparison to the currently used alloy, NARloy-Z (Cu-3 wt % Ag-0.5 wt % Zr), GRCop-84's significantly better properties give it the potential for significant gains in engine performance and reliability. For GRCop-84 to be safely used in a rocket engine, it is critical to develop a detailed data base of the important thermophysical and mechanical properties. Work has focused on five major properties: thermal conductivity, thermal expansion, tensile strength, creep resistance, and LCF life. The analysis went beyond simply measuring the data and reporting averages. A detailed statistical analysis was conducted that allowed regression of the data over the entire temperature range tested and establishment of design minimums. The design values were expressed as simple mathematical formulas that are highly amenable to use in computer codes such as in finite element analysis and related computer modeling work.
Derived from text
Alloys; Mechanical Properties; Rocket Engines; Thermophysical Properties; Fatigue Life

20050196725 NASA Glenn Research Center, Cleveland, OH, USA
GRCop-84: A High Temperature Copper-based Alloy For High Heat Flux Applications
Ellis, David L.; [2005]; 6 pp.; In English
Contract(s)/Grant(s): WBS 22-617-44-20; No Copyright; Avail: CASI; A02, Hardcopy

While designed for rocket engine main combustion chamber liners, GRCop-84 (Cu-8 at.% Cr-4 at.% Nb) offers potential for high heat flux applications in industrial applications requiring a temperature capability up to approximately 700 C (1292 F). GRCop-84 is a copper-based alloy with excellent elevated temperature strength, good creep resistance, long LCF lives and enhanced oxidation resistance. It also has a lower thermal expansion than copper and many other low alloy copper-based alloys. GRCop-84 can be manufactured into a variety of shapes such as tubing, bar, plate and sheet using standard production techniques and requires no special production techniques. GRCop-84 forms well, so conventional fabrication methods including stamping and bending can be used. GRCop-84 has demonstrated an ability to be friction stir welded, brazed, inertia welded, diffusion bonded and electron beam welded for joining to itself and other materials. Potential applications include plastic injection molds, resistance welding electrodes and holders, permanent metal casting molds, vacuum plasma spray nozzles and high temperature heat exchanger applications.
Author
Copper Alloys; Heat Flux; Heat Resistant Alloys; Chromium Alloys; Niobium Alloys; Fabrication

20050196780 Lawrence Livermore National Lab., Livermore, CA USA
Thermoelasticity at High Temperatures and Pressures for Ta
Orlikowski, D.; Sonderlind, P.; Moriarty, J. A.; Dec. 13, 2004; 10 pp.; In English
Report No.(s): DE2005-15014333; UCRL-PROC-208566; No Copyright; Avail: Department of Energy Information Bridge

A new methodology for calculating high temperature and pressure elastic moduli in metals has been developed accounting for both the electron-thermal and ion-thermal contributions. Anharmonic and quasi-harmonic thermoelasticity for bcc tantalum have thereby been calculated and compared as a function of temperature (\h12,000 K) and pressure (\h10 Mbar). In this approach, the full potential linear muffin-tin orbital (FP-LMTO) method for the cold and electron-thermal contributions is closely coupled with ion-thermal contributions obtained via multi-ion, quantum-based interatomic potentials derived from model generalized pseudopotential theory (MGPT). For the later contributions two separate approaches are used. In one approach, the quasi-harmonic ion-thermal contribution is obtained through a Brillouin zone sum of the strain derivatives of the phonons, and in the other the anharmonic ion-thermal contribution is obtained directly through Monte Carlo (MC) canonical distribution averages of strain derivatives on the multi-ion potentials themselves. The resulting elastic moduli compare well in each method and to available ultrasonic measurements and diamond-anvil-cell compression experiments indicating minimal anharmonic effects in bcc tantalum over the considered pressure range.
NTIS
High Temperature; Tantalum; Thermoelasticity

20050196792 Oak Ridge National Lab., TN USA, Stress Engineering Services, Inc., Houston, TX, USA
Understanding Damage Mechanisms in Ferritic/Martensitic Steels
Swindeman, R. W.; Maziasz, P. J.; January 2005; 10 pp.; In English
Report No.(s): DE2005-835660; No Copyright; Avail: Department of Energy Information Bridge

Advanced ferritic/martensitic steels are being used extensively in fossil energy applications. New steels such as 2 1/4Cr-W-V (T23, T24), 3Cr-W-V, 9Cr-Mo-V (T91), 7Cr-W-V, 9Cr-W-V (T92 and T911), and 12Cr-W-V (T122, SAVE 12, and NF12) are examples of tubing being used in boilers and heat recovery steam generators (1). Other products for these new steels

include piping, plates, and forgings. There is concern about the high-temperature performance of the advanced steels for several reasons. First, they exhibit a higher sensitivity to temperature than the 300 series stainless steels that they often replace. Second, they tend to be metallurgically unstable and undergo significant degradation at service temperatures in the creep range. Third, the experience base is limited in regard to duration. Fourth, they will be used for thick-section, high-pressure components that require high levels of integrity. To better understand the potential limitations of these steels, damage models are being developed that consider metallurgical factors as well as mechanical performance factors. Grade 91 steel was chosen as representative of these steels for evaluation of cumulative damage models since laboratory and service exposures of grade 91 exceed 100,000 hours.
NTIS
Degradation; Fossils; Martensite; Steels

20050196803 NASA Glenn Research Center, Cleveland, OH, USA
Ceramic Inclusions in Powder Metallurgy Disk Alloys: Characterization and Modeling
Bonacuse, Peter J.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Powder metallurgy alloys are increasingly used in gas turbine engines, especially in turbine disk applications. Although powder metallurgy materials have many advantages over conventionally cast and wrought alloys (higher strength, higher temperature capability, etc.), they suffer from the rare occurrence of ceramic defects (inclusions) that are inherent to the powder atomization process. These inclusions can have a potentially large detrimental effect on the durability of individual components. An inclusion in a high stress location can act as a site for premature crack initiation and thereby considerably reduce the fatigue life. Because these inclusions are exceedingly rare, they typically do not reveal themselves in the process of characterizing the material for a particular application (the cumulative volume of the test bars in a fatigue life characterization is typically on the order of a single actual component). Ceramic inclusions have, however, been found to be the root cause of a number of catastrophic engine failures. To investigate the effect of these inclusions in detail, we have undertaken a study where known populations of ceramic particles, whose composition and morphology are designed to mimic the 'natural' inclusions, are added to the precursor powder. Surface-connected inclusions have been found to have a particularly large detrimental effect on fatigue life; therefore, the quantity of ceramic 'seeds' added is calculated to ensure that a minimum number will intersect the surface of the fatigue test bars. Because the ceramic inclusions are irregularly shaped and have a tendency to break up in the process of extrusion and forging, a method of calculating the probability of occurrence and expected intercepted surface area was needed. We have developed a Monte Carlo simulation to determine the distributions of these parameters and have verified the simulated results with observations of ceramic inclusions found in macroscopic slices from extrusions and forgings. Fatigue specimens have been machined from Udimet 720 (a powder metallurgy superalloy) forgings, to determine the effects of the inclusions on fatigue life. The ultimate goal of this study will be to use probabilistic methods to determine the reliability detriment that can be attributed to these ceramic inclusions. This work has been supported by the Ultra Safe and Ultra- Efficient Engine Technologies programs.
Author
Ceramics; Powder Metallurgy; Cast Alloys; Characterization

20050196821 Army Research Lab., Hampton, VA, USA
Performance Enhancement Using Selective Reinforcement for Metallic Single- and Multi-Pin Loaded Holes
Farley, Gary L.; Seshadri, Banavara R.; [2005]; 14 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA
Contract(s)/Grant(s): 23-064-30-30; No Copyright; Avail: CASI; A03, Hardcopy

An analysis based investigation of aluminum with metal matrix composite selectively reinforced single- and multi-hole specimens was performed and their results compared with results from geometrically comparable non-reinforced specimens. All reinforced specimens exhibited a significant increase in performance. Performance increase of up to 170 percent was achieved. Specimen failure modes were consistent with results from reinforced polymeric matrix composite specimens. Localized reinforcement application (circular) proved as effective as a broader area (strip) reinforcement. Also, selective reinforcement is an excellent method of increasing the performance of multi-hole specimens.
Author
Metal Matrix Composites; Mechanical Properties; Matrix Methods

20050198852 NASA Glenn Research Center, Cleveland, OH, USA

The Role of Rhenium on the Temporal Evolution of the Nanostructure of a Model Ni-Al-Cr-Re Superalloy

Yoon, Kevin E.; Noebe, Ronald D.; Seidman, David N.; TMS Letters; 2004; Volume 1, No. 2, pp. 27-28; In English

Contract(s)/Grant(s): NGT3-52378; WBS 22-332-12-10-02

Report No.(s): E-14855; Copyright; Avail: Other Sources

Rhenium (2 at.%) additions to a model Ni-8.5 at.% Cr-10 at.% Al alloy are studied with respect to its effects on the temporal evolution of the nanostructure and the partitioning behavior of the four elements between the gamma (fcc) and gamma' (L1(sub 2)) phases. Chemical evolution of this quaternary alloy aged at 1073 K from 0.25 to 264 h, is investigated by three-dimensional atom-probe (3DAP) microscopy. The morphology of gamma'-precipitates remains spheroidal, even at an aging time of 264 h. The results demonstrate that Re slows the coarsening of gamma'-precipitates, in comparison to the ternary Ni-10 at.% A1-8.5 at.% Cr alloy at 1073 K.

Author

Heat Resistant Alloys; Nanostructure (Characteristics); Nickel Alloys; Chemical Evolution; Rhenium

20050198853 NASA Glenn Research Center, Cleveland, OH, USA

Dependence of Interfacial Excess on the Threshold Value of the Isoconcentration Surface

Yoon, Kevin E.; Noebe, Ronald D.; Hellman, Olof C.; Seidman, David N.; Surface and Interface Analysis; 2004; Volume 36, pp. 594-597; In English

Contract(s)/Grant(s): NGT3-52378; WBS 22-232-12-10-02

Report No.(s): E-14857; Copyright; Avail: Other Sources

The proximity histogram (or proxigram for short) is used for analyzing data collected by a three-dimensional atom probe microscope. The interfacial excess of Re (2.41 +/- 0.68 atoms/sq nm) is calculated by employing a proxigram in a completely geometrically independent way for gamma/gamma' interfaces in Rene N6, a third-generation single-crystal Ni-based superalloy. A possible dependence of interfacial excess on the variation of the threshold value of an isoconcentration surface is investigated using the data collected for Rene N6 alloy. It is demonstrated that the dependence of the interfacial excess value on the threshold value of the isoconcentration surface is weak.

Author

Histograms; Microscopy; Heat Resistant Alloys; Nickel Alloys; Solid-Solid Interfaces; Ion Probes; Rhenium

20050198864 NASA Glenn Research Center, Cleveland, OH, USA

The Influence of Tungsten on the Chemical Composition of a Temporally Evolving Nanostructure of a Model Ni-Al-Cr Superalloy

Sudbrack, Chantal K.; Isheim, Dieter; Noebe, Ronald D.; Jacobson, Nathan S.; Seidman, David N.; Microscopy and Microanalysis; 2004; Volume 10, pp. 355-365; In English

Contract(s)/Grant(s): NSF DMR-97-28986; WBS 22-708-04-03-05

Report No.(s): E-14859; Copyright; Avail: Other Sources

The influence of W on the temporal evolution of gamma' precipitation toward equilibrium in a model Ni-Al-Cr alloy is investigated by three-dimensional atom-probe (3DAP) microscopy and transmission electron microscopy (TEM). We report on the alloys Ni-10 Al-8.5 Cr (at.%) and Ni-10 Al-8.5 Cr-2 W (at.%), which were aged isothermally in the gamma + gamma' two-phase field at 1073 K, for times ranging from 0.25 to 264 h. Spheroidal-shaped gamma' precipitates, 5-15 nm diameter, form during quenching from above the solvus temperature in both alloys at a high number density (approx. 10(exp 23/cu m). As gamma' precipitates grow with aging at 1073 K, a transition from spheriodal- to cuboidal-shaped precipitates is observed in both alloys. The elemental partitioning and spatially resolved concentration profiles across the gamma' precipitates are obtained as a function of aging time from three-dimensional atom-by-atom reconstructions. Proximity histogram concentration profiles of the quaternary alloy demonstrate that W concentration gradients exist in gamma' precipitates in the as-quenched and 0.25-h aging states, which disappear after 1 h of aging. The diffusion coefficient of W in gamma' is estimated to be 6.2 x 10(exp -20) sq m/s at 1073 K. The W addition decreases the coarsening rate constant, and leads to stronger partitioning of Al to gamma' and Cr to gamma.

Author

Tungsten; Chemical Evolution; Heat Resistant Alloys; Chemical Composition; Precipitates; Nanostructure (Characteristics); Nickel Alloys

20050198865 NASA Glenn Research Center, Cleveland, OH, USA

The Temporal Evolution of the Nanostructure of a Model Ni-Al-Cr Superalloy

Sudbrack, Chantal K.; Yoon, Kevin E.; Noebe, Ronald D.; Seidman, David N.; TMS Letters; [2004]; Volume 1, No. 2, pp. 25-26; In English

Contract(s)/Grant(s): NGT3-52378; NSF DMR-02-41928; WBS 22-332-12-10-02

Report No.(s): E-14858; Copyright; Avail: Other Sources

The early to the later stages of precipitation of ordered gamma'-precipitates (L1(sub 2)) in Ni-5.2 Al-14.2 Cr (at.%) are studied at 873 K. Precipitates with radii as small as 0.45 nm are characterized fully by three-dimensional atom-probe (3DAP) microscopy. Contrary to what is often assumed by theory or in models, the average precipitate composition is shown to evolve with time, such that solute concentrations decrease toward an equilibrium value given by the solvus lines. Power-law time dependencies of the number density, mean radius, and supersaturations of Al and Cr are discussed in light of theoretical predictions for Ostwald ripening.

Author

Nanostructure (Characteristics); Chemical Evolution; Heat Resistant Alloys; Precipitates; Nickel Alloys

20050198866 NASA Glenn Research Center, Cleveland, OH, USA

Effect of Exposure on the Mechanical Properties of Gamma MET PX

Draper, S. L.; Lerch, B. A.; Locci, I. E.; Shazly, M.; Prakash, V.; [2004]; 21 pp.; In English

Contract(s)/Grant(s): 22-794-40-4F

Report No.(s): E-14860; Copyright; Avail: CASI; A03, Hardcopy

The effect of a service environment exposure on the mechanical properties of a high Nb content TiAl alloy, Gamma MET PX , was assessed. Gamma MET PX, like other TiAl alloys, experiences a reduction of ductility following high temperature exposure. Exposure in Ar, air, and high-purity oxygen all resulted in a loss of ductility with the ductility reduction increasing with oxygen content in the exposure atmosphere. Embrittling mechanisms, including bulk microstructural changes, moisture induced environmental embrittlement, and near surface effects were investigated. The embrittlement has been shown to be a near-surface effect, most likely due to the diffusion of oxygen into the alloy.

Author

Mechanical Properties; High Temperature; Diffusion; Microstructure; Embrittlement

20050198870 NASA Glenn Research Center, Cleveland, OH, USA

Site preference of ternary alloying additions to NiTi: Fe, Pt, Pd, Au, Al, Cu, Zr and Hf

Bozzolo, Guillermo; Noebe, Ronald D.; Mosca, Hugo O.; [2004]; 33 pp.; In English

Contract(s)/Grant(s): WBS 22-708-04-03-05

Report No.(s): E-14862; Copyright; Avail: CASI; A03, Hardcopy

Atomistic modeling of the site substitution behavior of Pd in NiTi (J. Alloys and Comp. (2004), in press) has been extended to examine the behavior of several other alloying additions, namely, Fe, Pt, Au, Al, Cu, Zr and Hf in this important shape memory alloy. It was found that all elements, to a varying degree, displayed absolute preference for available sites in the deficient sublattice. How- ever, the energetics of the different substitutional schemes, coupled with large scale simulations indicate that the general trend in all cases is for the ternary addition to want to form stronger ordered structures with Ti.

Author

Binary Alloys; Titanium Alloys; Shape Memory Alloys; Nickel Alloys; Alloying

20050198900 NASA Glenn Research Center, Cleveland, OH, USA

Analysis of Stainless Steel Sandwich Panels with a Metal Foam Care for Lightweight Fan Blade Design

Min, James B.; Ghosn, Louis J.; Lerch, Bradley A.; Raj, Sai V.; Holland, Frederic A., Jr.; Hebsur, Mohan G.; [2004]; 10 pp.; In English; 45th AIAA/ASME/ASCE/AHS/ASC SPM Conference, 19-22 Apr. 2004, Palm Springs, CA, USA

Contract(s)/Grant(s): WBS 22-708-24-01

Report No.(s): E-14601; AIAA Paper 1836; No Copyright; Avail: CASI; A02, Hardcopy

The quest for cheap, low density and high performance materials in the design of aircraft and rotorcraft engine fan and propeller blades poses immense challenges to the materials and structural design engineers. Traditionally, these components have been fabricated using expensive materials such as light weight titanium alloys, polymeric composite materials and carbon-carbon composites. The present study investigates the use of P sandwich foam fan blade made up of solid face sheets and a metal foam core. The face sheets and the metal foam core material were an aerospace grade precipitation hardened 17-4

PH stainless steel with high strength and high toughness. The stiffness of the sandwich structure is increased by separating the two face sheets by a foam core. The resulting structure possesses a high stiffness while being lighter than a similar solid construction. Since the face sheets carry the applied bending loads, the sandwich architecture is a viable engineering concept. The material properties of 17-4 PH metal foam are reviewed briefly to describe the characteristics of the sandwich structure for a fan blade application. A vibration analysis for natural frequencies and P detailed stress analysis on the 17-4 PH sandwich foam blade design for different combinations of skin thickness and core volume %re presented with a comparison to a solid titanium blade.
Author
Propeller Blades; Rotary Wings; Dynamic Structural Analysis; Structural Design; Sandwich Structures; Fan Blades; Metal Foams

20050198961 NASA Glenn Research Center, Cleveland, OH, USA
Compatibility of Niobium Alloys and Superalloys in a Flowing He-Xe Power Conversion System
Bowman, Cheryl L.; Ritzert, Frank J.; Smialek, James L.; Jaster, Mark L.; rker, Samuel P.; [2004]; 7 pp.; In English; International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA
Contract(s)/Grant(s): WBS 22-973-80-50
Report No.(s): E-14843; Copyright; Avail: CASI; A02, Hardcopy

Proposed concepts for an ambitious mission to explore Jupiter's three icy moons place significant demands on the various spacecraft systems. There are many challenges related to the high output power conversion systems being considered, and one example is the need to ensure system compatibility at all levels. The utilization of appropriate materials for component structures is important to ensuring long mission life. Refractory metal alloys have attractive high-temperature properties in inert environments, but these alloys are sometimes susceptible to contamination. Potential material compatibility issues exist between refractory metal candidates and more conventional alloys. Nb-1Zr has long been considered one of the most well characterized refractory alloys that is well suited for elevated-temperature use and liquid-metal compatibility. However, previous studies have suggested that niobium alloys can not co-exist in a closed system with traditional stainless steels or superalloys due to transport of contaminants. The relevance of this information to a proposed power conversion system is discussed. Also, experiments and fundamental calculations are being performed to determine contamination transport from candidate superalloys to Nb-1Zr in a closed system with an inert carrier gas. Potential protective schemes are explored to ensure system level compatibility between the refractory alloy Nb-1Zr and a nickel-based superalloy.
Author
Niobium Alloys; Helium; Xenon; Compatibility; Heat Resistant Alloys

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

20050188831 Defence Science and Technology Organisation, Victoria, Australia
The Chemical Resistance of Epoxy Adhesive Joints Exposed to Aviation Fuel and its Additives
Rider, Andrew; Yeo, Eudora; Mar. 2005; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434664; DSTO-TR-1650; DODA-AR-013-348; No Copyright; Avail: Defense Technical Information Center (DTIC)

Adhesively bonded structure and bonded composite repairs are often exposed to aviation fuel during service. A relatively limited number of studies examining the influence of fuel and the many additives it contains have been made. The current report details experimental studies that have examined the influence of fuel and common additives such as lubricity and deicing agents on the fracture toughness of metal and composite bonded adhesive joints. The studies aimed to determine if a series of reference fuels containing each of the additives may affect adhesive bond durability. Current results suggest that the bond durability of adhesive joints exposed for several thousands hours to fuel environments may reduce. Concentrated mixtures of water and deicing agent, which were prepared in order to simulate the environment in the bottom of fuel tanks, may also reduce joint fracture toughness. The present studies highlight the complexity of examining the influence of fuel

environments on adhesive joints and the need for further research to more quantifiably assess possible mechanisms of bond degradation in typical aircraft operating environments.
DTIC
Additives; Adhesive Bonding; Aircraft Fuels; Epoxy Resins; Joints (Junctions)

20050192558 Akron Univ., Akron, OH, USA
Low Melt Viscosity Resins for Resin Transfer Molding
Harris, Frank W.; [2002]; 11 pp.; In English
Contract(s)/Grant(s): NAG3-2572; No Copyright; Avail: CASI; A03, Hardcopy

In recent years, resin transfer molding (RTM) has become one of the methods of choice for high performance composites. Its cost effectiveness and ease of fabrication are major advantages of RTM. RTM process usually requires resins with very low melt viscosity (less than 10 Poise). The optimum RTM resins also need to display high thennal-oxidative stability, high glass transition temperature (T(sub g)), and good toughness. The traditional PMR-type polyimides (e.g. PMR-15) do not fit this requirement, because the viscosities are too high and the nadic endcap cures too fast. High T(sub g), low-melt viscosity resins are highly desirable for aerospace applications and NASA s Reusable Launch Vehicle (RLV) program. The objective of this work is to prepare low-melt viscosity polyimide resins for RTM or resin film infusion (RFI) processes. The approach involves the synthesis of phenylethynyl-terminated imide oligomers. These materials have been designed to minimize their melt viscosity so that they can be readily processed. During the cure, the oligomers undergo both chain extension and crosslinking via the thermal polymerization of the phenylethynyl groups. The Phenylethynyl endcap is preferred over the nadic group due to its high curing temperature, which provides broader processing windows. This work involved the synthesis and polymerization of oligomers containing zig-zag backbones and twisted biphenyl structures. Some A-B type precursors which possessed both nitro and anhydride functionality, or both nitro and amine functionality, were also synthesized in order to obtain the well defined oligomers. The resulting zig-zag structured oligomers were then end-capped with 4-phenylethynylphthalic anhydride (PEPA) for further cure. The properties of these novel imide oligomers are evaluated.
Author
Resin Transfer Molding; Viscosity; Melts (Crystal Growth)

20050196070 Virginia Commonwealth Univ., Richmond, VA USA
Block Copolymer Composites: A Bio-Optic Synthetic System for Dynamic Control of Refractive Index
Wnek, Gary E.; Smith, Thomas W.; Jun. 2005; 72 pp.; In English
Contract(s)/Grant(s): MDA972-02-C-0052; DARPA ORDER-N540/00
Report No.(s): AD-A434903; TR-528865; No Copyright; Avail: CASI; A04, Hardcopy

This 18 month program focused on the development of hybrid polymer systems capable of dynamic refractive index change using electric field modulation.
DTIC
Block Copolymers; Dynamic Control; Electric Fields; Refractivity

20050196267 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Effect of Temperature and Steam Environment on Fatigue Behavior of an Oxide-Oxide Continuous Fiber Ceramic Composite
Eber, Chalene A.; Mar. 2005; 107 pp.; In English
Report No.(s): AD-A435235; AFIT/GA/ENY/05-M09; No Copyright; Avail: Defense Technical Information Center (DTIC)

There is an ever-increasing need for materials that maintain high strength and fracture toughness at elevated temperatures and in complex environments. Advanced aerospace applications are motivating the development of composite materials that can meet demanding requirements. This research effort investigates mechanical behavior of an oxide-oxide continuous fiber ceramic composite (CFCC) consisting of a porous alumina matrix reinforced with mullite/ alumina Nextel 720 fibers developed specifically for advanced aerospace applications. Tension-tension fatigue behavior of this CFCC was studied at 1200 and 1330 C in laboratory air and 100% steam environments. Fatigue resistance and retained strength properties were determined. Effects of environmental degradation was addressed in detail.
DTIC
Ceramic Fibers; Ceramics; Composite Materials; Fiber Composites; High Temperature; Oxides; Steam; Temperature Effects; Thermal Fatigue

20050196558 Army Research Lab., Cleveland, OH, USA
PMR Extended Shelf Life Technology Given 2000 R and D 100 Award
Meador, Michael A.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

An approach developed at the NASA Glenn Research Center for extending the shelf life of PMR polyimide solutions and prepregs received an R&D 100 Award this year. PMR polyimides, in particular PMR-15, have become attractive materials for a variety of aerospace applications because of their outstanding high-temperature stability and performance. PMR-15 can be used in components with exposures to temperatures as high as 290 C, which leads to substantial reductions in weight, as much as 30 percent over metal components. PMR-15 composites are used widely in aerospace applications ranging from ducts and external components in aircraft engines to an engine access door for the Space Shuttle Main Engine. A major barrier to more widespread use of these materials is high component costs. Recent efforts at Glenn have addressed the various factors that contribute to these costs in an attempt to more fully utilize these lightweight, high-temperature materials.
Derived from text
Polyimides; Storage Stability; Service Life

20050196559 Cleveland State Univ., Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Thermodynamics of Volatile Silicon Hydroxides Studied
Copland, Evan H.; Opila, Elizabeth J.; Jacobson, Nathan S.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Silicon-based ceramics are promising candidate structural materials for heat engines. The long-term stability of these materials to environmental degradation is dependent on the formation and retention of a protective SiO2 layer. It is well known that SiO2 forms stable volatile hydroxides in the presence of water vapor at elevated temperatures. Combustion conditions, which characteristically are at high velocities, contain significant water vapor pressures, and high temperatures tend to promote continuous formation of these hydroxides with resulting material degradation. For the degradation of silicon-based ceramics to be predicted, accurate thermodynamic data on the formation of silicon hydroxides are needed.
Derived from text
Silicon Dioxide; Ceramics; Thermodynamics

20050196578 NASA Glenn Research Center, Cleveland, OH, USA
Effects of Vacuum Ultraviolet Radiation on Thin Polyimide Films Evaluated
Dever, Joyce A.; Messer, Russell K.; Powers, Charles; Townsend, Jacqueline A.; Wooldridge, Eve; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

NASA anticipates launching the Next Generation Space Telescope (NGST) mission-- whose purpose is to examine the origins of our universe by making measurements in the infrared portion of the spectrum--in 2009. So that the telescope can operate at very low temperatures (less than 100 K), a halo orbit about the second Lagrangian point (L2) is being considered because it is far from Earth and its reflected sunlight. The Sun-Earth L2 point is located 1.53 10(exp 6) km from the Earth in the direction away from the Sun. This mission presents new challenges in many areas of technology, including the development of a multilayer insulation sunshield for the telescope. This sunshield is required to be large (proposed dimensions of approximately 33 by 14 m), storable, deployable, and lightweight. In addition, its polymer film layers must be seamable, foldable, and resistant to tearing and creep, with low outgassing. The sunshield must maintain its structural integrity and its Sun-facing side must maintain a low solar absorptance to thermal emittance ratio (alpha/epsilon) over the planned 10-yr mission duration including over 80,000 hr facing constant sunlight.
Derived from text
Vacuum Effects; Polyimides; Thin Films; Far Ultraviolet Radiation

20050196625 DYNACS Engineering Co., Inc., USA, NASA Glenn Research Center, Cleveland, OH, USA, Cleveland State Univ., Cleveland, OH, USA
Upper Temperature Limit of Environmental Barrier Coatings for Enabling Propulsion Materials Established
Lee, Kang N.; Fox, Dennis S.; Robinson, R. Craig; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Silicon-based ceramics, such as SiC/SiC composites and Si3N4, are the prime candidates for hot section structural components of next-generation gas turbines. A key barrier to such an application is the rapid recession of silicon-based ceramics in combustion environments because of the volatilization of silica scale by water vapor (refs. 1 and 2). Environmental

barrier coatings (EBC's) were developed to prevent recession in the High Speed Research--Enabling Propulsion Materials (HSR-EPM) Program (refs. 3 and 4). An investigation under the Ultra-Efficient Engine Technology Program was undertaken at the NASA Glenn Research Center to establish the upper temperature limit of the EPM EBC.
Derived from text
Ceramic Coatings; Gas Turbine Engines; Silicon Nitrides; Silicon Dioxide

20050196681 Ohio Aerospace Inst., OH, USA
Silicon Nitride Plates for Turbine Blade Application: FEA and NDE Assessment
Abdul-Aziz, Ali; Baaklini, George Y.; Bhatt, Ramakrishna T.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Engine manufacturers are continually attempting to improve the performance and the overall efficiency of internal combustion engines. The thermal efficiency is typically improved by raising the operating temperature of essential engine components in the combustion area. This reduces the heat loss to a cooling system and allows a greater portion of the heat to be used for propulsion. Further improvements can be achieved by diverting part of the air from the compressor, which would have been used in the combustor for combustion purposes, into the turbine components. Such a process is called active cooling. Increasing the operating temperature, decreasing the cooling air, or both can improve the efficiency of the engine. Furthermore, lightweight, strong, tough hightemperature materials are required to complement efficiency improvement for nextgeneration gas turbine engines that can operate with minimum cooling. Because of their low-density, high-temperature strength, and thermal conductivity, ceramics are being investigated as potential materials for replacing ordinary metals that are currently used for engine hot section components. Ceramic structures can withstand higher operating temperatures and other harsh environmental factors. In addition, their low densities relative to metals helps condense component mass (ref. 1). The objectives of this program at the NASA Glenn Research Center are to develop manufacturing technology, a thermal barrier coating/environmental barrier coating (TBC/EBC), and an analytical modeling capability to predict thermomechanical stresses, and to do minimal burner rig tests of silicon nitride (Si3N4) and SiC/SiC turbine nozzle vanes under simulated engine conditions. Furthermore, and in support of the latter objectives, an optimization exercise using finite element analysis and nondestructive evaluation (NDE) was carried out to characterize and evaluate silicon nitride plates with cooling channels.
Derived from text
Silicon Nitrides; Turbine Blades; Nondestructive Tests

20050196747 Bureau of Reclamation, Denver, CO USA
Investigations of Plastic Flims for Canal Linings
Hickey, M. E.; January 1969; 46 pp.; In English
Report No.(s): PB2005-106525; No Copyright; Avail: CASI; A03, Hardcopy

Plastic film is one of the many materials developed by the Bureau of Reclamation under the Open and Closed Conduits System (OCCS) program for lining canals. This report documents the more than 20 years of field and laboratory investigations and experience with buried plastic film used to suppress seepage in canals and other waterways. In addition to summarizing field and laboratory investigations, the report provides specifications for plastic lining and general information on installation and costs. It can be used to advantage by irrigation water users, water districts, and others concerned with water savings by control of seepage from canals and impoundments. Early studies made of several plastic films and plastic coated materials indicated that polyvinyl-chloride (PVC) and polyethylene film could be used successfully as buried lining. More recently, two new plastic film materials, ethylene vinyl acetate copolymer (EVAC) and chlorinated polyethylene, were added to the program.
NTIS
Canals; Linings; Plastics; Polymeric Films

20050198893 NASA Langley Research Center, Hampton, VA, USA
Electrospinning of Polyvinylidene Fluoride and Polyetherimide From Mixed Solvents
Morgret, Leslie D.; Pawlowski, Kristin J.; Hinkley, Jeffrey A.; July 2005; 12 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WU 23-064-50-10
Report No.(s): NASA/TM-2005-213786; L-19153; No Copyright; Avail: CASI; A03, Hardcopy

Polyvinylidene fluoride and Ultem(TradeMark) polyetherimide were dissolved in 50/50 acetone/N,N dimethylformamide (DMF) and 80/20 tetrahydrofuran/DMF, respectively, and electrospun. Polymer solution concentrations and molecular weights were changed while other spinning parameters (voltage, distance, solution feed rate) were held constant. Fiber diameters in

the resulting electrospun mats varied from 0.25 to 4.4 microns, increasing with polymer concentration and molecular weight; trends in diameter were compared with trends in viscosities and surface tensions of the spinning solutions.
Author
Interfacial Tension; Tetrahydrofuran; Electric Potential; Fluorides; Acetone; Vinyl Polymers

20050198934 QSS Group, Inc., Cleveland, OH, USA
Joining and Assembly of Silicon Carbide-Based Advanced Ceramics and Composites for High Temperature Applications
Singh, M.; [2004]; 21 pp.; In English; International Symposium on New Fontier of Advanced Si-Based Ceramics and Composites, 20-23 Jun. 2004, Gyenongju, Korea, Republic of
Contract(s)/Grant(s): NAS3-00145; 22-376-70-30
Report No.(s): E-14761; No Copyright; Avail: CASI; A03, Hardcopy

Silicon carbide based advanced ceramics and fiber reinforced composites are under active consideration for use in wide variety of high temperature applications within the aeronautics, space transportation, energy, and nuclear industries. The engineering designs of ceramic and composite component require fabrication and manufacturing of large and complex shaped parts of various thicknesses. In many instances, it is more economical to build up complex shapes by joining simple geometrical shapes. In addition these components have to be joined or assembled with metallic sub-components. Thus, joining and attachment have been recognized as enabling technologies for successful utilization of ceramic components in various demanding applications. In this presentation, various challenges and opportunities in design, fabrication, and testing o high temperature joints in ceramic matrix composites will be presented. Silicon carbide based advanced ceramics (CVD and hot pressed), and C/SiC and SiC/SiC composites, in different shapes and sizes, have been joined using an affordable, robust ceramic joining technology (ARCJoinT). Microstructure and high temperature mechanical properties of joints in silicon carbide ceramics and CVI and melt infiltrated SiC matrix composites will,be reported. Various joint design philosophies and design issues in joining of ceramics and composites well be discussed.
Author
Ceramics; Ceramic Matrix Composites; Composite Materials; Silicon Carbides

20050199442 NASA Glenn Research Center, Cleveland, OH, USA
Extensional Rheology Experiment Developed to Investigate the Rheology of Dilute Polymer Solutions in Microgravity
Logsdon, Kirk A.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A fundamental characteristic of fluid is viscosity; that is, the fluid resists forces that cause it to flow. This characteristic, or parameter, is used by manufacturers and end-users to describe the physical properties of a specific material so that they know what to expect when a material, such as a polymer, is processed through an extruder, a film blower, or a fiber-spinning apparatus. Normally, researchers will report a shear viscosity that depends on the rate of an imposed shearing flow. Although this type of characterization is sufficient for some processes, simple shearing experiments do not provide a complete picture of what a processor may expect for all materials. Extensional stretching flows are common in many polymer-processing operations such as extrusion, blow molding, and fiber spinning. Therefore, knowledge of the complete rheological (ability to flow and be deformed) properties of the polymeric fluid being processed is required to accurately predict and account for the flow behavior. In addition, if numerical simulations are ever able to serve as a priori design tools for optimizing polymer processing operations such as those described above, an accurate knowledge of the extensional viscosity of a polymer system and its variation with temperature, concentration, molecular weight, and strain rate is critical.
Derived from text
Rheology; Polymers; Microgravity; Molecular Weight; Flow Characteristics; Deformation

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PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

20050188630 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Pulse Detonation Engine Thrust Tube Heat Exchanger for Flash Vaporization and Supercritical Heating of JP-8
Miser, Christen L.; Mar. 2005; 202 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434265; AFIT/GAE/ENY/05-M11; No Copyright; Avail: CASI; A10, Hardcopy

Research has shown that performance of liquid hydrocarbon fueled pulse detonation engines is limited by the time required to evaporate liquid fuel droplets within the mixture. Vaporization of liquid fuels prior to injection has been shown to decrease ignition times and also increases fuel efficiency; however, the size and efficiency of the vaporization system used are not feasible for use in future pulse detonation aircraft concepts. The purpose of this research is to harness the waste heat of pulse detonation engine thrust tubes to generate a steady-state, self-sustained flash vaporization and supercritical heating system using JP-8 as the working fluid and fuel. Using a pulse detonation engine thrust tube mounted heat exchanger, the successful flash vaporization of JP-8 has been demonstrated. Additional testing demonstrated the successful heating of JP-8 to supercritical conditions with fuel injection temperatures over 760 K. All JP-8 flash vaporization and supercritical heating tests were sustained by the heated fuel and run to steady-state conditions. Heat addition rates to the fuel of up to 7.7 kW were achieved during superheated testing. A method for experimentally determining supercritical fluid density is presented based on the findings of the supercritical heating tests.
DTIC
Heating; Jet Engine Fuels; JP-8 Jet Fuel; Pulse Detonation Engines; Thrust; Tube Heat Exchangers; Vaporizing

20050188656 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Evaluation of Fuel Oxygenate Degradation in the Vadose Zone
Torres, David A.; Mar. 2005; 138 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434297; AFIT/GES/ENV/05M-05; No Copyright; Avail: CASI; A07, Hardcopy

Groundwater contamination by petroleum products poses a potential human health and safety risk. Methyl tert-butyl ether (MTBE) was a commonly used fuel oxygenate that was added to gasoline to meet environmental regulations. The widespread use of MTBE resulted in significant contamination of drinking water supplies across the USA. This research evaluated the degradation characteristics of potential alternative fuel oxygenates in the vadose zone. One fuel oxygenate being considered as an alternative to MTBE is diisopropyl ether (DIPE). Specifically, this thesis sought to answer three research questions: what is the potential for DIPE degradation in soil without prior microbial augmentation, how does the presence of co-contaminants, such as ethanol and toluene, impact the biodegradation of DIPE, and will the increased use of DIPE represent a potential environmental risk? Previous research related to fuel oxygenates has focused primarily on oxygenates currently used, such as MTBE and ethanol. This research focused on a potential alternative to MTBE prior to its widespread implementation and use. An experiment was run for 30 days to assess degradation characteristics for DIPE, ethanol, and toluene in the vadose zone. Due to the short length of the experiment it is not possible to determine if DIPE degradation occurred.
DTIC
Contamination; Degradation; Ground Water; Water Pollution

20050195845 National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Cool Flames and Autoignition: Thermal-Ignition Theory of Combustion Experimentally Validated in Microgravity
Pearlman, Howard; Chapek, Richard M.; Research and Technology 1999; March 2000; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The objective of this study at the NASA Glenn Research Center at Lewis Field is to hone our understanding of spontaneous chemical reactions and determine the various factors that influence when, where, and how cool flames and autoignitions develop. These factors include the molecular structure of the fuel, the pressure and temperature of the mixture, and the various ways in which heat can be lost - through conduction, convection, or radiation. Generally, radiation heat transfer is weak at low temperatures, and most of the heat is lost through convection or conduction.
Author
Microgravity; Spontaneous Combustion; Fuels

20050196078 Department of the Air Force, Norton AFB, CA USA
Environmental Assessment. Chemical Release Experiment
Jul. 1987; 53 pp.; In English
Report No.(s): AD-A434925; No Copyright; Avail: Defense Technical Information Center (DTIC)

1. The U.S. Air Force proposes to conduct an experiment to identify the potential environmental consequences of an inadvertent release of hydrazine rocket propellant in space, during orbital or suborbital operations. The experiment will be sponsored by the Space Defense Initiative Organization. The experiment will be managed by the U.S. Air Force Space Technology Center. 2. The experiment will be conducted in the thermosphere of outer space, at an earth of about 300 km. 3.

The experiment will involve the ejection of three Get Away Special (GAS) satellites (one during the first and two during the second Shuttle flight), each containing about 100 pounds of specified hydrazine fuel, plus the required circuitry for tracking and ordinance activation. 4. The satellites will be ejected from a Space Shuttle which will be launched from Kennedy Space Center.
DTIC
Aerospace Environments; Environmental Surveys; Hydrazines

20050196154 ManTech Environmental Technology, Inc., Dayton, OH USA
Pharmacokinetic Modeling of JP-8 Jet Fuel Components: I. Nonane and C9-C12 Aliphatic Components
Robinson, Peter J.; Mar. 2000; 37 pp.; In English
Contract(s)/Grant(s): F41624-96-C-9010; Proj-7757
Report No.(s): AD-A435036; AFRL-HE-WP-TR-2000-0046; No Copyright; Avail: CASI; A03, Hardcopy

Exposures to JP-8 can occur from vapor, liquid or aerosol. Inhalation and dermal are the most prevalent routes of exposure, and acute effects include neurobehavioral deficits. Occupational exposures of interest include aircraft fuel tank workers and exhaust workers. JP-8 is a complex mixture of hundreds of components including straight chain alkanes, branched chain alkanes, cycloalkanes, diaromatics and napthalenes. A first step to developing a physiologically-based pharmacokinetic (PBPK) model for JP-8 is to develop models for representative components. Nonane is a good biomarker in breath for JP-8 aliphatic exposure (fingerprint compound). Nonane is a highly lipophilic compound (log Kow = 5.65), and has been observed to distribute preferentially in brain tissue. Its behavior in the body can he described in terms of a physiologically-based pharmacokinetic (PBPK) model that includes the blood, lungs, liver, muscle, and fat. Such a model is developed on the basis of in-house rat inhalation data (with measured blood levels), and validated by applying it to published rat inhalation data (blood and brain levels). The model is used to predict body burdens of nonane under occupational exposure conditions (ambient air concentrations for fuel tank workers and aircraft attendants) and is consistent with limited occupational body burden data (exhaled breath levels) .
DTIC
Aliphatic Hydrocarbons; Engine Parts; Fuel Systems; Jet Engine Fuels; JP-8 Jet Fuel; Models; Nonanes; Pharmacology

20050196674 NASA Glenn Research Center, Cleveland, OH, USA
Hydrogen/Air Fuel Nozzle Emissions Experiments
Smith, Timothy D.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The use of hydrogen combustion for aircraft gas turbine engines provides significant opportunities to reduce harmful exhaust emissions. Hydrogen has many advantages (no CO2 production, high reaction rates, high heating value, and future availability), along with some disadvantages (high current cost of production and storage, high volume per BTU, and an unknown safety profile when in wide use). One of the primary reasons for switching to hydrogen is the elimination of CO2 emissions. Also, with hydrogen, design challenges such as fuel coking in the fuel nozzle and particulate emissions are no longer an issue. However, because it takes place at high temperatures, hydrogen-air combustion can still produce significant levels of NOx emissions. Much of the current research into conventional hydrocarbon-fueled aircraft gas turbine combustors is focused on NOx reduction methods. The Zero CO2 Emission Technology (ZCET) hydrogen combustion project will focus on meeting the Office of Aerospace Technology goal 2 within pillar one for Global Civil Aviation reducing the emissions of future aircraft by a factor of 3 within 10 years and by a factor of 5 within 25 years. Recent advances in hydrocarbon-based gas turbine combustion components have expanded the horizons for fuel nozzle development. Both new fluid designs and manufacturing technologies have led to the development of fuel nozzles that significantly reduce aircraft emissions. The goal of the ZCET program is to mesh the current technology of Lean Direct Injection and rocket injectors to provide quick mixing, low emissions, and high-performance fuel nozzle designs. An experimental program is planned to investigate the fuel nozzle concepts in a flametube test rig. Currently, a hydrogen system is being installed in cell 23 at NASA Glenn Research Center's Research Combustion Laboratory. Testing will be conducted on a variety of fuel nozzle concepts up to combustion pressures of 350 psia and inlet air temperatures of 1200 F. Computational fluid dynamics calculations, with the Glenn developed National Combustor Code, are being performed to optimize the fuel nozzle designs.
Author
Exhaust Emission; Hydrogen Fuels; Nozzle Design; Gas Turbine Engines; Air Flow; Technology Utilization

20050196680 NASA Glenn Research Center, Cleveland, OH, USA

Zero-Boiloff Cryogenic Storage Cryocooler Integration Test

Plachta, David W.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Developments in NASA Glenn Research Center's Centaur work have led to an exciting new cryogenic storage concept being considered for future NASA space missions. With long-duration cryogenic storage, propellants will boil off because of the environmental heating of the tank. To accommodate these losses, extra propellant is required along with larger propellant tanks. Analyses of space transportation concepts show that spacetransfer cryogenic stages with the zero boiloff (ZBO) cryogenic storage concept reduce the stage mass for missions longer than approximately 45 days in low Earth orbit. The ZBO system consists of an active cryocooling system using a cryocooler in addition to traditional passive thermal insulation. Engineers at Glenn analyzed, designed, built, and bench tested a heat exchanger and integration hardware for a large-scale ZBO demonstration for the NASA Marshall Space Flight Center. The heat exchanger, which transfers the heat that enters the tank from the fluid to the cryocooler, must limit the temperature difference across it to limit the cryocooler size and power requirements. With a low temperature difference, the system efficiency is improved. For that temperature difference to be reduced, the thermal conductivity must be as high as possible at liquid hydrogen temperatures, around 25 K (-248 C). In addition, it is important for the heat exchanger to be welded to a stainless steel flange and have enough strength to accommodate piping stress. High-conductivity copper was selected and fabricated, then integrated with the stainless steel piping tee as shown in the cutaway representation. Literature showed that this conductivity might range from 2 to 100 W/cm/K but that is was likely to be around 13 W/cm/K. Unexpectedly, this conductivity was measured to be 23 W/cm/K, which limited the temperature increase along the heat exchanger to just 2 K. This limited temperature increase, compared with the predicted difference of 3.5 K, improves the overall system efficiency by 7.4 percent and limits the expected integration losses to a projected 4 percent with a flight design for liquid hydrogen storage. These results improve the cryocooler integration concept by allowing the cryocooler to operate at a lower input power, or by potentially permitting a smaller cryocooler to be selected. Author

Cryogenic Cooling; Systems Integration; Cryogenic Fluid Storage; Fabrication; NASA Space Programs

20050196682 NASA Glenn Research Center, Cleveland, OH, USA

Laser Absorption Measurements of Equivalence Ratios Studied Along With Their Coupling to Pressure Fluctuations in Lean Premixed Prevaporized (LPP) Combustion

Nguyen, Quang-Viet; Research and Technology 2000; March 2001; 5 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Concerns about damaging the Earth's ozone layer as a result of high levels of nitrogen oxides (known collectively as NOx) from high-altitude, high-speed aircraft have prompted the study of lean premixed prevaporized (LPP) combustion in aircraft engines. LPP combustion reduces NOx emissions principally by reducing the peak flame temperatures inside an engine. Recent advances in LPP technologies have realized exceptional reductions in pollutant emissions (single-digit ppm NOx for example). However, LPP combustion also presents major challenges: combustion instability and dynamic coupling effects between fluctuations in heat-release rate, dynamic pressure, and fuel pressure. These challenges are formidable and can literally shake an engine apart if uncontrolled. To better understand this phenomenon so that it can be controlled, we obtained real-time laser absorption measurements of the fuel vapor concentration (and equivalence ratio) simultaneously with the dynamic pressure, flame luminosity, and time-averaged gaseous emissions measurements in a research-type jet-A-fueled LPP combustor. The measurements were obtained in NASA Glenn Research Center's CE-5B optically accessible flame tube facility. The CE-5B facility provides inlet air temperatures and pressures similar to the actual operating conditions of real aircraft engines. The laser absorption measurements were performed using an infrared 3.39 micron HeNe laser in conjunction with a visible HeNe laser for liquid droplet scattering compensation.

Author

Absorption Spectroscopy; Combustion Products; Laser Spectroscopy; Pressure Oscillations; Fuel Combustion; Nitrogen Oxides

20050198965 NASA Glenn Research Center, Cleveland, OH, USA

Simplified Two-Time Step Method for Calculating Combustion and Emission Rates of Jet-A and Methane Fuel With and Without Water Injection

Molnar, Melissa; Marek, C. John; [2005]; 30 pp.; In English; 43rd AIAA Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2005, Reno, NV, USA

Contract(s)/Grant(s): WBS 22-714-20-10

Report No.(s): AIAA Paper 2005-0549; E-14900; No Copyright; Avail: CASI; A03, Hardcopy

A simplified kinetic scheme for Jet-A, and methane fuels with water injection was developed to be used in numerical combustion codes, such as the National Combustor Code (NCC) or even simple FORTRAN codes. The two time step method is either an initial time averaged value (step one) or an instantaneous value (step two). The switch is based on the water concentration in moles/cc of 1x10(exp -20). The results presented here results in a correlation that gives the chemical kinetic time as two separate functions. This two time step method is used as opposed to a one step time averaged method previously developed to determine the chemical kinetic time with increased accuracy. The first time averaged step is used at the initial times for smaller water concentrations. This gives the average chemical kinetic time as a function of initial overall fuel air ratio, initial water to fuel mass ratio, temperature, and pressure. The second instantaneous step, to be used with higher water concentrations, gives the chemical kinetic time as a function of instantaneous fuel and water mole concentration, pressure and temperature (T4). The simple correlations would then be compared to the turbulent mixing times to determine the limiting rates of the reaction. The NASA Glenn GLSENS kinetics code calculates the reaction rates and rate constants for each species in a kinetic scheme for finite kinetic rates. These reaction rates are used to calculate the necessary chemical kinetic times. Chemical kinetic time equations for fuel, carbon monoxide and NOx are obtained for Jet-A fuel and methane with and without water injection to water mass loadings of 2/1 water to fuel. A similar correlation was also developed using data from NASA's Chemical Equilibrium Applications (CEA) code to determine the equilibrium concentrations of carbon monoxide and nitrogen oxide as functions of overall equivalence ratio, water to fuel mass ratio, pressure and temperature (T3). The temperature of the gas entering the turbine (T4) was also correlated as a function of the initial combustor temperature (T3), equivalence ratio, water to fuel mass ratio, and pressure.
Author (revised)
Jet Engine Fuels; Methane; Water Injection; Kinetic Equations; Fuel Combustion

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy*.

20050192587 NASA Glenn Research Center, Cleveland, OH, USA
Growth and Morphology of Supercritical Fluids Studied in Microgravity on Mir
Wilkinson, R. Allen; Research and Technology 1999; March 2000; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Growth and Morphology of Supercritical Fluids (GMSF) is an international experiment facilitated by the NASA Glenn Research Center at Lewis Field and under the guidance of U.S. principal investigator Professor John Hegseth of the University of New Orleans and three French coinvestigators Daniel Beysens, Yves Garrabos, and Carole Chabot. In early 1999, GMSF experiments were operated for 20 days on the Russian Space Station Mir. Mir astronauts performed experiments One through Seven, which spanned the three science themes of near-critical phase separation rates, interface dynamics in near-critical boiling, and measurement of the spectrum of density fluctuation length scales very close to the critical point. The fluids used were pure CO2 or SF6. Three of the five thermostats used could adjust the sample volume with the scheduled crew time. Such a volume adjustment enabled variable sample densities around the critical density as well as pressure steps (as distinct from the usual temperature steps) to be applied to the sample.
Derived from text
Morphology; Supercritical Fluids; Microgravity; Mir Space Station

20050192644 NASA Glenn Research Center, Cleveland, OH, USA
Physics of Hard Spheres Experiment: Significant and Quantitative Findings Made
Doherty, Michael P.; Research and Technology 1999; March 2000; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Direct examination of atomic interactions is difficult. One powerful approach to visualizing atomic interactions is to study near-index-matched colloidal dispersions of microscopic plastic spheres, which can be probed by visible light. Such spheres interact through hydrodynamic and Brownian forces, but they feel no direct force before an infinite repulsion at contact. Through the microgravity flight of the Physics of Hard Spheres Experiment (PHaSE), researchers have sought a more complete understanding of the entropically driven disorder-order transition in hard-sphere colloidal dispersions. The experiment was conceived by Professors Paul M. Chaikin and William B. Russel of Princeton University. Microgravity was

required because, on Earth, index-matched colloidal dispersions often cannot be density matched, resulting in significant settling over the crystallization period. This settling makes them a poor model of the equilibrium atomic system, where the effect of gravity is truly negligible. For this purpose, a customized light-scattering instrument was designed, built, and flown by the NASA Glenn Research Center at Lewis Field on the space shuttle (shuttle missions STS 83 and STS 94). This instrument performed both static and dynamic light scattering, with sample oscillation for determining rheological properties. Scattered light from a 532- nm laser was recorded either by a 10-bit charge-coupled discharge (CCD) camera from a concentric screen covering angles of 0 to 60 or by sensitive avalanche photodiode detectors, which convert the photons into binary data from which two correlators compute autocorrelation functions. The sample cell was driven by a direct-current servomotor to allow sinusoidal oscillation for the measurement of rheological properties. Significant microgravity research findings include the observation of beautiful dendritic crystals, the crystallization of a 'glassy phase' sample in microgravity that did not crystallize for over 1 year in 1g (Earth's gravity), and the emergence of face-centered-cubic (FCC) crystals late in the coarsening process (as small crystallites lost particles to the slow ripening of large crystallites). Significant quantitative findings from the microgravity experiments have been developed describing complex interactions among crystallites during the growth process, as concentration fields overlap in the surrounding disordered phase. Time-resolved Bragg scattering under microgravity captures one effect of these interactions quite conclusively for the sample at a volume fraction of 0.528. From the earliest time until the sample is almost fully crystalline, the size and overall crystallinity grow monotonically, but the number of crystallites per unit volume (number density) falls. Apparently nucleation is slower than the loss of crystallites because of the transfer of particles from small to large crystals. Thus, coarsening occurs simultaneously with growth, rather than following the completion of nucleation and growth as is generally assumed. In the same sample, an interesting signature appears in the apparent number density of crystallites and the volume fraction within the crystallites shortly before full crystallinity is reached. A brief upturn in both indicates the creation of more domains of the size of the average crystallite simultaneous with the compression of the crystallites. Only the emergence of dendritic arms offers a reasonable explanation. The arms would be 'seen' by the light scattering as separate domains whose smaller radii of curvature would compress the interior phase. In fiscal year 1999, numerous papers, a doctoral dissertation, and the PHaSE final report were produced. Although this flight project has been completed, plans are in place for a follow-on colloid experiment by Chaikin and Russel that employs a light microscope within Glenn's Fluids and Combustion Facility on the International Space Station. PHaSE is providing us with a deeper understanding of the nure of phase transitions. The knowledge derived has added to the understanding of condensed matter. In addition, the burgeoning study of the dynamics of colloidal self-assembly may lead to the development of a range of photonic materials that control the desirable properties of light. Thus, applications of ordered colloidal structures include not only ultrastructure ceramics, but also photonic crystals and photothermal nanosecond light-switching devices. Industries dealing with semiconductors, electro-optics, ceramics, and composites stand to benefit from such advancements.

Author

Microgravity; Spheres; Spaceborne Experiments; Quantitative Analysis; Condensed Matter Physics

20050194716 NASA Lewis Research Center, Cleveland, OH, USA

Binary Colloidal Alloy Test Conducted on Mir

Hoffmann, Monica I.; Ansari, Rafat R.; Research and Technology 1998; April 1999; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Colloids are tiny (submicron) particles suspended in fluid. Paint, ink, and milk are examples of colloids found in everyday life. The Binary Colloidal Alloy Test (BCAT) is part of an extensive series of experiments planned to investigate the fundamental properties of colloids so that scientists can make colloids more useful for technological applications. Some of the colloids studied in BCAT are made of two different sized particles (binary colloidal alloys) that are very tiny, uniform plastic spheres. Under the proper conditions, these colloids can arrange themselves in a pattern to form crystals. These crystals may form the basis of new classes of light switches, displays, and optical devices. Windows made of liquid crystals are already in the marketplace. These windows change their appearance from transparent to opaque when a weak electric current is applied. In the future, if the colloidal crystals can be made to control the passage of light through them, such products could be made much more cheaply. These experiments require the microgravity environment of space because good quality crystals are difficult to produce on Earth because of sedimentation and convection in the fluid. The BCAT experiment hardware included two separate modules for two different experiments. The 'Slow Growth' hardware consisted of a 35-mm camera with a 250-exposure photo film cartridge. The camera was aimed toward the sample module, which contained 10 separate colloid samples. A rack of small lights provided backlighting for the photographs. The BCAT hardware was launched on the shuttle and was operated aboard the Russian space station Mir by American astronauts John Blaha and David Wolf (launched September 1996 and returned January 1997; reflown September 1997 and returned January 1998). To begin the experiment, one of these

astronauts would mix the samples to disperse the colloidal particles and break up any crystals that might have already formed. Once the samples were mixed and the experiment was powered on, the hardware operated autonomously, taking photos of the colloidal samples over a 90-day period.
Author (revised)
Binary Alloys; Colloids; Mir Space Station; Spaceborne Experiments

20050194720 NASA Lewis Research Center, Cleveland, OH, USA
Coarsening in Solid-Liquid Mixtures Studied on the Space Shuttle
Caruso, John J.; Research and Technology 1998; April 1999; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Ostwald ripening, or coarsening, is a process in which large particles in a two-phase mixture grow at the expense of small particles. It is a ubiquitous natural phenomena occurring in the late stages of virtually all phase separation processes. In addition, a large number of commercially important alloys undergo coarsening because they are composed of particles embedded in a matrix. Many of them, such as high-temperature superalloys used for turbine blade materials and low-temperature aluminum alloys, coarsen in the solid state. In addition, many alloys, such as the tungsten-heavy metal systems, coarsen in the solid-liquid state during liquid phase sintering. Numerous theories have been proposed that predict the rate at which the coarsening process occurs and the shape of the particle size distribution. Unfortunately, these theories have never been tested using a system that satisfies all the assumptions of the theory. In an effort to test these theories, NASA studied the coarsening process in a solid-liquid mixture composed of solid tin particles in a liquid lead-tin matrix. On Earth, the solid tin particles float to the surface of the sample, like ice in water. In contrast, in a microgravity environment this does not occur. The microstructures in the ground- and space-processed samples (see the photos) show clearly the effects of gravity on the coarsening process. The STS-83-processed sample (right image) shows nearly spherical uniformly dispersed solid tin particles. In contrast, the identically processed, ground-based sample (left image) shows significant density-driven, nonspherical particles, and because of the higher effective solid volume fraction, a larger particle size after the same coarsening time. The 'Coarsening in Solid-Liquid Mixtures' (CSLM) experiment was conducted in the Middeck Glovebox facility (MGBX) flown aboard the shuttle in the Microgravity Science Laboratory (MSL-1/1R) on STS-83/94. The primary objective of CSLM is to measure the temporal evolution of the solid particles during coarsening.
Derived from text
Ostwald Ripening; Binary Systems (Materials); Coarseness; Spaceborne Experiments; Gravitational Effects; Eutectic Alloys

20050194724 NASA Lewis Research Center, Cleveland, OH, USA, Rensselaer Polytechnic Inst., Troy, NY, USA
Third and Final Shuttle Mission of the Isothermal Dendritic Growth Experiment Conducted: Highest Supercooling Ever Recorded Achieved
Glicksman, Martin E.; Malarik, Diane C.; Research and Technology 1998; April 1999; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Dendrites describe the treelike crystal morphology commonly assumed in metals and alloys that freeze from supercooled or supersaturated melts. There remains a high level of engineering interest in dendritic solidification because the size, shape, and orientation of the dendrites determine the final microstructure of a material. It is the microstructure that then determines the physical properties of cast or welded products. Although it is well known that dendritic growth is controlled by the transport of latent heat from the moving solid-liquid interface, an accurate and predictive model has not yet been developed. The effects of gravity-induced convection on the transfer of heat from the interface have prevented adequate testing, under terrestrial conditions, of solidification models. The Isothermal Dendritic Growth Experiment (IDGE) constituted a series of three microgravity experiments flown aboard the Space Shuttle Columbia. The apparatus was used to grow and record dendrite solidification in the absence of gravity-induced convective heat transfer, thereby producing a wealth of benchmark-quality data for testing solidification models and theories.
Derived from text
Spaceborne Experiments; Dendritic Crystals; Crystal Growth; Supercooling

20050195842 NASA Glenn Research Center, Cleveland, OH, USA
Burning Plastics Investigated in Space for Unique US/Russian Cooperative Project
Friedman, Robert; Research and Technology 1999; March 2000; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

It is well known that fires in the low-gravity environment of Earth-orbiting spacecraft are different from fires on Earth.

The flames lack the familiar upward plume, which is the result of gravitational buoyancy. These flames, however, are strongly influenced by minor airflow currents. A recent study conducted in low gravity (microgravity) on the Russian orbital station Mir used burning plastic rods mounted in a small chamber with a controllable fan to expose the flame to airflows of different velocities. In this unique project, a Russian scientific agency, the Keldysh Research Center, furnished the apparatus and directed the Mir tests, while the NASA Glenn Research Center at Lewis Field provided the test materials and the project management. Reference testing and calibrations in ground laboratories were conducted jointly by researchers at Keldysh and at the NASA Johnson Space Center's White Sands Test Facility. Multiple samples of three different plastics were burned in the tests: Delrin, a common material for valve bodies; PMMA, a plastic 'glass"; and polyethylene, a familiar material for containers and films. Each burned with a unique spherical or egg-shaped flame that spread over the rod. The effect of varying the airflow was dramatic. At the highest airflow attainable in the combustion chamber, nearly 10 cm/sec (a typical ventilation breeze), the flames were bright and strong. As airflow velocity decreased, the flames became shorter but wider. In addition, the flames became less bright, and for PMMA and polyethylene, they showed two colors, a bright part decreasing in volume and a nearly invisible remainder (see the photographs). Finally, at a very low velocity, the flames extinguished. For the plastics tested, this minimum velocity was very low, around 0.3 to 0.5 cm/sec. This finding confirms that at least a slight airflow is required to maintain a flame in microgravity for these types of materials.
Author
Combustion Physics; Delrin (Trademark); Polyethylenes; Acrylic Resins; Spaceborne Experiments

20050195864 DYNACS Engineering Co., Inc., USA, NASA Glenn Research Center, Cleveland, OH, USA
Specimens Prepared for Materials International Space Station Experiment
Banks, Bruce A.; deGroh, Kim K.; Dever, Joyce A.; Jaworske, Donald A.; Miller, Sharon K.; Snyder, Aaron; Sechkar, Edward A.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Materials International Space Station Experiment (MISSE) is a materials flight experiment sponsored by the Materials and Manufacturing Directorate of the Air Force Research Laboratory at Wright-Patterson Air Force Base and the NASA Space Environmental Effects Program at the NASA Marshall Space Flight Center. MISSE is a cooperative effort among the Air Force, several NASA field centers, and industry. The experiment package will be placed on the exterior of the International Space Station in the summer of 2001. Approximately half of the specimens will be exposed to the space environment for 1 year, and the other half will be exposed for 3 years. The Electro-Physics Branch at the NASA Glenn Research Center has prepared and delivered over 150 specimens to be included in MISSE. Specimens include: 1) Double-coated polyimide Kapton to compare mass loss from in-space atomic oxygen undercutting erosion to ground-laboratory atomic oxygen undercutting erosion for predicting in-space durability; 2) Silicones to study changes in surface hardness and optical properties after combined atomic oxygen--ultraviolet radiation exposure for predicting in-space durability; 3) Forty-one different polymers to accurately measure their atomic oxygen erosion yields; 4) Scattering chambers to study atomic oxygen scattering characteristics that are relevant to the degradation found in spacecraft with exterior openings; 5) Thin polymer film disks and tensile specimens to study the effects of radiation on their optical properties and mechanical properties; 6) Lightweight intercalated graphite epoxy composites to study electromagnetic interference shielding performance; and 7) Polymer-based materials utilizing new atomic oxygen protection concepts to study their durability.
Author (revised)
International Space Station; NASA Space Programs; Spaceborne Experiments; Materials Science; Specimens

31
ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

20050188599 Naval Observatory, Washington, DC USA
The Allan Variance as an Estimator of the Long-Memory Parameter: Time-Domain and Wavelet Methods
Schmidt, Lara S.; Skinner, James G.; Jan. 2005; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434220; No Copyright; Avail: CASI; A03, Hardcopy

The Allan variance is a well-known estimator of frequency stability and is often used to classify a time series into one of the standard clock noise types. By identifying the power-law model for clock noise with its long-memory equivalent, the Allan variance can also serve as an estimate for the long-memory parameter. Although the Allan variance is not a maximum

likelihood estimator, it can be used with regression techniques that employ minimum variance estimates. This work describes the analytic basis for using the Allan variance to estimate the memory parameter, and performance of several Allan-variance-based estimators is illustrated via simulation study. Maximum likelihood estimation is also discussed, and the performance of maximum-likelihood estimators is contrasted with that of the Allan-variance-based estimators.
DTIC
Time Domain Analysis; Time Series Analysis; Wavelet Analysis

20050188654 Naval Observatory, Washington, DC USA
The Accuracy of Two-Way Satellite Time Transfer Calibrations
Breakiron, Lee A.; Smith, Alan L.; Fonville, Blair C.; Powers, Edward; Matsakis, Demetrios N.; Jan. 2005; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434295; No Copyright; Avail: CASI; A03, Hardcopy

Results from successive calibrations of Two-Way Satellite Time and Frequency Transfer (TWSTFT) operational equipment at USNO and five remote stations using portable TWSTFT equipment are analyzed for internal and external errors, finding an average random error of 0.35 ns, an average type-B uncertainty of 0.15 ns, and an average total error of 0.38 ns for a single calibration measurement over time spans of up to 4.9 years. Closure discrepancies suggest that the operational apparatus is at least as good as the calibration equipment.
DTIC
Calibrating; Time Series Analysis

20050188749 Naval Observatory, Washington, DC USA
Near-Term Time Transfer Technologies and International Atomic Time (TAI)
Matsakis, Demetrios; Jan. 2005; 3 pp.; In English
Report No.(s): AD-A434482; No Copyright; Avail: Defense Technical Information Center (DTIC)

While there are many forms of time-transfer, the most precise long-distance forms currently used for the generation of TAI and Coordinated Universal Time (UTC) involve either GPS or Two Way Satellite Time Transfer (TWSTT). This paper will give a brief description of their current and future capabilities, with emphasis on their uncertainties. Some of these uncertainties are due to inherent modeling or receiver instabilities, while others can be reduced through temperature and humidity stabilization, electronic impedance matching, and multipath minimization. The residual time-transfer uncertainties directly affect the uncertainties in each individual laboratory's realization of UTC.
DTIC
Atomic Clocks; Atoms

20050188750 Naval Observatory, Washington, DC USA
First Evaluation and Experimental Results on the Determination of Uncertainties in UTC - UTC (k)
Lewandowski, W.; Matsakis, D.; Panfilo, G.; Tavella, P.; Jan. 2005; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434483; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this work, we present a preliminary study of the uncertainty of UTC UTC (k). In the first part of the paper, we consider an analytical solution considering the law of the propagation of uncertainty. In the second part, we verify the analytical results numerically, using the software used for the generation of UTC.
DTIC
Atomic Clocks; Linkages; Numerical Analysis; Universal Time

20050188751 Naval Observatory, Washington, DC USA
Accounting for Timing Biases Between GPS, Modernized GPS, and Galileo Signals
Hegarty, Chris; Powers, Ed; Fonville, Blair; Jan. 2005; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434484; No Copyright; Avail: Defense Technical Information Center (DTIC)

GPS timing and navigation user solutions are based on pseudorange measurements made by correlating user receiver-generated replica signals with the signals broadcast by the GPS satellites. Any bias resulting from this correlation process within the user receiver tends to be common across all receiver channels when the signal characteristics are identical (code type, modulation type, and bandwidth). Such common biases will cancel in the user navigation solution and appear as a fixed bias for timing solutions. New GPS signals and the future addition of the Galileo system are somewhat different from the legacy signals broadcast by GPS today and new ways of accounting for biases will be needed. This paper will quantify

timing biases between the different legacy and modernized GPS and Galileo signals broadcast on L1 and their dependencies on factors like user receiver filter bandwidth, filter transfer function, and delay-locked loop (DLL) correlator spacing.
DTIC
Bias; Galileo Spacecraft; Global Positioning System; Navigation; Timing Devices

20050192625 Miami Univ., Coral Gables, FL, USA
A Novel Airfoil Circulation Augment Flow Control Method Using Co-Flow Jet
Zha, Ge-Cheng; Paxton, Craig; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 469-495; In English; See also 20050192624; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

A novel subsonic airfoil circulation augment technique using co-flow jet (CFJ) to achieve superior aerodynamic performance for subsonic aircraft is proved numerically by CFD simulation. The advantages of co-flow jet airfoil include high lift at high angle of attack, ultra high C(sub t)/C(sub d) at cruise point, and low penalty to the overall cycle efficiency of the airframe-propulsion system.
Author (revised)
Airfoils; Aerodynamic Characteristics; Computational Fluid Dynamics; Simulation

20050192629 North Carolina State Univ., Raleigh, NC, USA
Role of Turbulence Modeling in Flow Prediction of Circulation Control Airfoils
McGowan, G.; Gopalarathnam, A.; Xiao, X.; Hassan, H.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 275-293; In English; See also 20050192624; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The kappa - sigma turbulence model and the kappa - sigma transitional/turbulence model are used to investigate the flow past 103RE(103 XW) circulation control airfoil, at a Mach number of 0.6, a Reynolds number of 5.2 x 10(exp 6) and a range of momentum coefficients. Preliminary results suggest that the nature of the flow in the cavity plays a major role in determining the flow over the airfoil.
Author
Turbulence Models; Aerodynamic Characteristics; Circulation Control Airfoils

20050192636 NASA Langley Research Center, Hampton, VA, USA
A Wind Tunnel Experiment for Trailing Edge Circulation Control on a 6 Percent 2-D Airfoil up to Transonic Mach Numbers
Alexander, Michael G.; Anders, Scott G.; Johnson, Stuart K.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 407-434; In English; See also 20050192624; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

A wind tunnel test was conducted on a six percent thick slightly cambered elliptical circulation control airfoil with both upper and lower surface blowing. Parametric evaluations of jet slot heights and Coanda surface shapes were conducted at mass flow coefficients (C(sub mu)) from 0.0 to 0.12. The test data was acquired in the NASA Langley Transonic Dynamics Tunnel at Mach numbers of 0.8 and 0.3 at Reynolds numbers per foot of 1.05 x 10(exp 6) and 2.43 x 10(exp 5) respectively. For the transonic condition, (Mach = 0.8 at alpha = +3 deg), it was generally found that the smaller slot and larger Coanda surface were more effective overall than other slot/Coanda surface combinations. Generally it was found at Mach = 0.3 at alpha = 6 deg that the smaller slot and smaller Coanda surface were more effective overall than other slot/Coanda surface combinations.
Author
Wind Tunnel Tests; Circulation Control Airfoils; Two Dimensional Models; Transonic Speed; Trailing Edges

20050195884 NASA Glenn Research Center, Cleveland, OH, USA
Advanced Communications Architecture Demonstration Made Significant Progress
Carek, David Andrew; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Simulation for a ground station located at 44.5 deg latitude. The Advanced Communications Architecture Demonstration (ACAD) is a concept architecture to provide high-rate Ka-band (27-GHz) direct-to-ground delivery of payload data from the International Space Station. This new concept in delivering data from the space station targets scientific experiments that buffer data onboard. The concept design provides a method to augment the current downlink capability through the Tracking

Data Relay Satellite System (TDRSS) Ku-band (15-GHz) communications system. The ACAD concept pushes the limits of technology in high-rate data communications for space-qualified systems. Research activities are ongoing in examining the various aspects of high-rate communications systems including: (1) link budget parametric analyses, (2) antenna configuration trade studies, (3) orbital simulations (see the preceding figure), (4) optimization of ground station contact time (see the following graph), (5) processor and storage architecture definition, and (6) protocol evaluations and dependencies.
Derived from text
Architecture (Computers); Communication; Data Transmission

20050196036 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA
Standardized UXO Technology Demonstration Site Blind Grid Scoring Record No. 362
Overbay, Larry, Jr.; Archiable, Robert; McClung, Christina; Robitaille, George; Mar. 2005; 53 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434849; ATC-8827; No Copyright; Avail: CASI; A04, Hardcopy

This scoring record documents the efforts of U.S. Army Corps of Engineers Engineering Research and Development Center (ERDC) to detect and discriminate inert unexploded ordnance (UXO) utilizing the YPG Standardized UXO Technology Demonstration Site Blind Grid. The scoring record was coordinated by Larry Overbay and by the Standardized UXO Technology Demonstration Site Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental, Security Technology Certification Program, the Strategic Environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center.
DTIC
Ammunition; Detection; Ordnance; Scoring; Standardization

20050196054 Platinum International, Inc., Alexandria, VA USA
U.S. Army UXO Environmental Remediation and Active Range Clearance Technology Strategic Plan
Van Deuren, Julie; Liu, Wei-Han; Chhetry, Shobha; Sperka, Johnathan; Dec. 1999; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DACA31-96-D-0082
Report No.(s): AD-A434881; PII-0216501-01; SFIM-AEC-PC-CR-2002028; No Copyright; Avail: Defense Technical Information Center (DTIC)

Under contract to the U.S. Army Environmental Center and Platinum International, Inc., this plan was developed to ensure that the Army's overall UXO Technology Development, Testing, and Evaluation (RDT&E) program is responsive to the short and long term requirements of the user community, is adequately funded, is properly executed, and promotes technology system usage in the field. Also, this plan will ensure the Army compliance with DoD Directive 4715.11, 'Environmental and Explosives Safety Management on Department of Defense Active and Inactive Ranges within the USA.' The purpose of this plan is to provide an overarching UXO technology strategic plan within the Army which will establish integrated guiding principles, goals and objectives for addressing UXO technology requirements and deficiencies that will provide an overarching Army strategy within the DoD framework for developing UXO technologies.
DTIC
Ammunition; Clearances; Environment Management; Ordnance

20050196094 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Collection Methods and Laboratory Processing of Samples From Donnelly Training Area Firing Points, Alaska, 2003
Walsh, Marianne E.; Ramsey, Charles A.; Collins, Charles M.; Hewitt, Alan D.; Walsh, Michael R.; Bjella, Kevin L.; Lambert, Dennis J.; Perron, Nancy M.; Mar. 2005; 74 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434947; ERDC/CRREL-TR-05-6; SFIM-AEC-AT-CR-2005002; No Copyright; Avail: Defense Technical Information Center (DTIC)

At firing points for lO5-mm howitzers 2,4-DNT is detectable in the surface soils 2,4-DNT is listed as a hazardous substance by the FPA and several states including Alaska. Sample collection methods and laboratory subsampling procedures were developed to estimate the mean concentration of 2,4-DNT at a sparsely vegetated firing point. Collection of replicate 5O-increment samples where the \h2-mm fraction was approximately 3 kg, was found to be adequate to estimate a statistically

valid upper confidence limit of the mean concentration of 2,4-DNT from a lO,800-m (2) area.
DTIC
Education; Explosives; Sampling; Soil Sampling; Soils

20050196119 Army Research Lab., Aberdeen Proving Ground, MD USA
Capabilities of Experimental Facilities 110G and 110E
Deal, Eleanor C.; Apr. 2005; 22 pp.; In English
Report No.(s): AD-A434979; ARL-TN-239; No Copyright; Avail: Defense Technical Information Center (DTIC)
The capabilities of Experimental Facilities 110E and 110G are explained in this technical note. The comparisons between the gun sizes and the launch weights are shown on the various tables.
DTIC
Guns (Ordnance); Launching; Research Facilities; Test Facilities

20050196544 Department of the Navy, Arlington, VA USA
Joint Single Integrated Air Picture (SIAP) System Engineering Organization (JSSEO) Standard Event Test Report Template
Dec. 2004; 41 pp.; In English
Report No.(s): AD-A434911; JSSEO-TR-2004-0010; No Copyright; Avail: CASI; A03, Hardcopy
This report contains a template on how to write a research report, detailing such items as the summary, overview, background, summary of effort, lessons learned and conclusions and recommendations.
DTIC
Images; Systems Engineering; Systems Integration; Templates

20050198938 NASA Glenn Research Center, Cleveland, OH, USA
Granular Materials and the Risks They Pose for Success on the Moon and Mars
Wilkinson, R. Allen; Behringer, Robert P.; Jenkins, James T.; Louge, Michel Y.; September 29, 2004; 8 pp.; In English; Space Technology and Applications International Forum 2005, 13-17 Feb. 2005, Albuquerque, NM, USA
Contract(s)/Grant(s): NNC04GB08G; WBS 22-400-32-30-16
Report No.(s): E-14867; No Copyright; Avail: CASI; A02, Hardcopy
Working with soil, sand, powders, ores, cement and sintered bricks, excavating, grading construction sites, driving off-road, transporting granules in chutes and pipes, sifting gravel, separating solids from gases, and using hoppers are so routine that it seems straightforward to do it on the Moon and Mars as we do it on Earth. This paper brings to the fore how little these processes are understood and the millennia-long trial-and-error practices that lead to today's massive over-design, high failure rate, and extensive incremental scaling up of industrial processes because of the inadequate predictive tools for design. We present a number of pragmatic scenarios where granular materials play a role, the risks involved, and what understanding is needed to greatly reduce the risks.
Author
Granular Materials; Construction Materials; Engineering Management; Structural Engineering; Reliability Engineering; Environmental Engineering; In Situ Resource Utilization; Lunar Logistics; Materials Handling; Structural Failure; Lunar Soil; Lunar Dust; Manned Mars Missions; Lunar Excavation Equipment

20050199428 RAND Corp., Santa Monica, CA USA
Wind Tunnel and Propulsion Test Facilities: An Assessment of NASA's Capabilities to Serve National Needs
Anton, Philip S.; Gritton, Eugene C.; Mesic, Richard; Steinberg, Paul; Johnson, Dana J.; Jan. 2004; 138 pp.; In English
Contract(s)/Grant(s): DASW01-01-C-0004
Report No.(s): AD-A428965; No Copyright; Avail: CASI; A07, Hardcopy
This monograph reveals and discusses the National Aeronautics and Space Administration's (NASA's) wind tunnel and propulsion test facility management issues that are creating real risks to the USA' competitive aeronautics advantage.
DTIC
Jet Propulsion; Propulsion; Test Facilities; Wind Tunnel Tests; Wind Tunnels

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see *03 Air Transportation and Safety*; and *16 Space Transportation and Safety*.

20050188588 Space and Naval Warfare Systems Center, San Diego, CA USA
ILIR '01: SSC San Diego In-House Laboratory Independent Research 2001 Annual Report
Flynn, T. V.; Kolb, R. C.; May 2002; 133 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434202; SSC/SD-TR-3125; No Copyright; Avail: CASI; A07, Hardcopy

This document reports status and achievements for the fiscal year (FY) 2001 Navy In-House Laboratory Independent Research (ILIR) program at Space and Naval Warfare Systems Center, San Diego (SSC San Diego). ILIR enables SSC San Diego to perform innovative, promising research consistent with its mission and with the policies of the Chief of Naval Research and the Department of the Navy. Three team projects were funded in FY 2001: Knowledge Mining for Command and Control Systems; Chaos Control and Nonlinear Dynamics in Antenna Arrays; and Robust Waveform Design for Tactical Communication Channels. In terms of productivity statistics, the FY 2001 ILIR program was highly successful, with a total of 85 papers/proceedings/books/dissertations published or submitted and 57 presentations made by SSC San Diego ILIR investigators. There were also 4 ILIR-related patents, 13 patent applications, and 24 patent disclosures produced during FY 01. The Project Summaries contained in this Annual Report cover the following research topics: Command and Control; Communications; Intelligence, Surveillance, and Reconnaissance; Navigation and Applied Sciences.
DTIC
Command and Control; Intelligence; Marine Transportation; Research; Surface Navigation

20050188614 Joint Chiefs of Staff, Washington, DC USA
Command and Control for Joint Air Operations
Jun. 2003; 94 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434238; JCS-PUB-3-30; No Copyright; Avail: CASI; A05, Hardcopy

This publication provides fundamental principles and doctrine for the command and control of joint air operations throughout the range of military operations. This publication has been prepared under the direction of the Chairman of the Joint Chiefs of Staff. It sets forth doctrine to govern the joint activities and performance of the Armed Forces of the USA in joint operations and provides the doctrinal basis for US military involvement in multinational and interagency operations. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders (JFCs) and prescribes doctrine for joint operations and training. It provides military guidance for use by the Armed Forces in preparing their appropriate plans. It is not the intent of this publication to restrict the authority of the JFC from organizing the force and executing the mission in a manner the JFC deems most appropriate to ensure unity of effort in the accomplishment of the overall mission.
DTIC
Command and Control; Military Operations

20050188686 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Determining a Relationship Between Foreign News Media Reports Covering U.S. Military Events and Network Incidents Against DoD Networks
Jaros, Jason D.; Mar. 2005; 97 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434342; AFIT/GIR/ENV/05M-08; No Copyright; Avail: CASI; A05, Hardcopy

This thesis explores the nature of the relationship between foreign news media and network incidents against DoD networks. A rank correlation was performed between the number of network incidents against DoD networks and foreign news media reports covering U.S. Military events. Further analysis was conducted to determine the key terms used in the contents of foreign news media reports for the months the reports were significantly correlated with network incidents. Several significant correlations were found between various combinations of regions and categories of network incidents. However, the correlations were only moderate and the key terms only led to a slightly better understanding of such relationships.
DTIC
Communication Networks; News Media

20050188699 Office of the Special Assistant for Gulf War Illness, Falls Church, VA USA
Marine Communications in Desert Shield and Desert Storm
Jan. 1991; 125 pp.; In English
Report No.(s): AD-A434358; No Copyright; Avail: CASI; A06, Hardcopy

The Fleet Marine Force entered the 1990s with a mixture of old and new equipment and communication organizations that had not been substantially changed in the nearly two decades since the end of the Vietnam War. Its communication personnel were adequately trained, with many of the officers and staff NCOs having experience in both aviation and ground units. Duty with joint and other service commands had also served to broaden the horizons of more senior communication officers. Modern digital communications equipment was on its way to the FMF that promised to increase both the flexibility and the capacity of units to effectively support field commanders in the contemporary joint operations environment.
DTIC
Communication Equipment; Deserts; Military Operations; Persian Gulf; Storms; Warfare

20050188714 Massachusetts General Hospital, Boston, MA USA
CIMIT/TATRC Symposium on Developing a Plug-and-Play Open Networking Standard for the Operating Room of the Future
Goldman, Julian M.; May 2005; 42 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0592
Report No.(s): AD-A434388; No Copyright; Avail: CASI; A03, Hardcopy

Medicine - and specifically, the operating room environment - has not had the benefit of standardized control and communication systems. As a result, many self-evident improvements - such as seamless data communication, medical device integration, remote device actuation, and distributed closed-loop control systems - have been precluded, and safety and economic benefits have not been realized. Funding was sought for a symposium to begin the process of defining technical and clinical requirements for a bus-independent Plug-and-Play (PnP) standardization framework for medical devices in the Operating Room of the Future (ORF). To effectively define these requirements and set an agenda for standards development required convening a group of medical device producers, clinical users, facility biomedical engineers, governmental regulators (including the FDA), and standards-writing experts. The two-day symposium was organized to 1) educate the participants in relevant technology, the regulatory picture, and clinical practice; 2) provide a forum for discovery of important issues and barriers to implementing PnP in the ORF; and 3) organize participants' contributions to refine the concepts, establish a consensus to move forward, and generate material to serve as the foundation for the proposed ORF PnP standard.
DTIC
Communication Networks; Conferences; Medical Equipment; Plugs

20050188729 Army War Coll., Carlisle Barracks, PA USA
Centralized Control/Decentralized Execution: A Valid Tenet of Airpower
Santicola, Henry J.; Mar. 2005; 35 pp.; In English
Report No.(s): AD-A434411; No Copyright; Avail: CASI; A03, Hardcopy

Centralized control and decentralized execution are fundamental tenets of air power that have evolved over decades of aerial employment and centuries of command and control during war. Air power has unique characteristics that require a different command and control construct than surface-centric combat units. The tenets of centralized control and decentralized execution have recently come under fire due to emerging transformational concepts such as Network-Centric Warfare (NCW) and Effects-Based Operations (EBO). This paper examines the history of the concept of centralized control/decentralized execution from the advent of modern warfare through Operation Enduring Freedom. Current doctrinal definitions are discussed with an emphasis on the differences between Air Force doctrine and joint doctrine. The study highlights the result of poorly articulated doctrinal definitions, and demonstrates that service and joint doctrine as currently written make the concept of centralized control and decentralized execution logically impossible. Service and joint doctrine should change. Even in the face of emerging joint operations concepts, centralized control and decentralized execution remains a valid tenet for the organization and employment of air power.
DTIC
Command and Control; Military Operations

20050188768 21st Century Systems, Inc., Herndon, VA USA
Fielded Agent-Based Geo-Analysis Network (FAGAN)
Burleson, Harold L.; Woodley, Robert; Agarwal, Sanjeev; Apr. 2005; 43 pp.; In English
Contract(s)/Grant(s): W74V8H-04-P-0487
Report No.(s): AD-A434524; ARI-TR-2005-02; No Copyright; Avail: CASI; A03, Hardcopy

Traditional military command & control (C2) usually evokes images of operators in command centers. We consider mounted or dismounted Soldier going from points A to B in interconnected, information rich battlefield. This is C2 on a different scale. While the digital battlefield provides a tremendous amount of information to gain a tactical advantage, there are challenges to meet. The challenge is to sift through this information and identify critical information to help plan or re-plan the mission. The team of 21st Century, Inc. and University of Missouri - Rolla is developing an agent-based decision-aiding system and technologies to train and assist the Soldier through that challenge. Our research examines planning and interactive terrain analysis incorporating spatial and temporal terrain details and dynamically changing intelligence information through battlefield networks. When given the mission intent, the system will be able to provide dynamic guidance for interactive terrain analysis and mission planning. Our system will be for the Soldier of the future trained in virtual, scenario-based simulation environments. Rather than developing specialized training environments, the emphasis of our system is embedded training of the Soldier so that the training interface is created around the Soldier's actual combat vehicle and systems.
DTIC
Command and Control; Decision Support Systems; Intelligence; Network Analysis; Terrain; Terrain Analysis

20050188773 Space and Naval Warfare Systems Center, San Diego, CA USA
SSC San Diego Strategic Plan. Revision 1
Apr. 1998; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434532; SSC-TD-3000-REV-1; No Copyright; Avail: CASI; A03, Hardcopy

Looking forward into the next century, our overriding challenge is to provide the nation's warriors with the tools they need to achieve battlespace information dominance. This Strategic Plan is SSC San Diego's blueprint to meet that challenge. The plan is both a vehicle for carrying us into the future and a set of guidelines for addressing near-term tactical issues. As an organization, we believe that strategic planning provides a critically needed context for adopting dynamic, agile processes to better use our corporate resources and meet our customers' needs. The plan defines our corporate vision, strategic objectives to realize that vision, and actions to achieve, those objectives. Realizing our vision - to be the nation's pre-eminent provider of integrated C4ISR solutions for warrior information dominance - is our enduring goal. Our plan specifies five long-range strategic objectives. SSC San Diego's Executive Board has defined and agreed upon these five objectives and has selected measurable, time-specific actions we must take to achieve them. The objectives address financial, programmatic, workforce and business processes we need to build to sustain our competitive advantage as we continually reposition ourselves to reflect changing environments.
DTIC
Command and Control; Management Planning; Oceans; Surveillance

20050188807 Florida Univ., Gainesville, FL USA
Juxtaposed Integration Matrix: A Crisis Communication Tool
Cunningham, James H., III; May 2005; 133 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434584; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this study was to field test the Juxtaposed Integration Matrix, a crisis communication tool, in real and simulated crisis scenarios by U.S. Air Force public affairs officers. Practitioners at three test locations found the matrix validated public relations postures and actions. Practitioners reported the matrix validated public relations strategies and provided an additional tool to present public relations tactics to the dominant coalition. Additionally, qualitative and quantitative content analyses of media articles were compared with actual military press releases. This analysis supported interview data and showed practitioners' actions were situationally dependent. From a theoretical perspective, this study also found the matrix added parsimony to the contingency theory of accommodation by reducing the number of variables to essentially three questions.
DTIC
Command and Control; Emergencies; Management Methods; Public Relations

20050192500 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

International GPS Service 2001 - 2002 Technical Reports

Gowey, Ken, Editor; Neilan, Ruth, Editor; Moore, Angelyn, Editor; September 2004; 374 pp.; In English; See also 20050192501 - 20050192550; Original contains color illustrations

Contract(s)/Grant(s): NAS7-1407

Report No.(s): JPL-Publ-04-017; No Copyright; Avail: CASI; C01, CD-ROM; A16, Hardcopy

Applications of the Global Positioning System (GPS) to Earth Science are numerous. The International GPS Service (IGS), a federation of government agencies and universities, plays an increasingly critical role in support of GPS-related research and engineering activities. Contributions from the IGS Governing Board and Central Bureau, analysis and data centers, station operators, and others constitute the 2001 / 2002 Technical Reports. Hard copies of each volume can be obtained by contacting the IGS Central Bureau at the Jet Propulsion Laboratory. This report is published in black and white. To view graphs or plots that use color to represent data trends or information, please refer to the online PDF version at http://igscb.jpl.nasa.gov/overview/pubs.html.

Author

Earth Sciences; Global Positioning System; Information Systems

20050192502 Institut Geographique National, France

Time Series Combination of Station Positions and Earth Orientation Parameters

Altamimi, Zuheir; Boucher, Claude; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 35-40; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

CATREF software developed to generate ITRF solutions was enhanced in order to rigorously combine station positions (and velocities) together with Earth Orientation Parameters (EOP). It is also well adapted for time series combination of station positions and EOP's. We present in this paper some comparative analysis of available time series solutions provided in SINEX format from 4 techniques: VLBI, SLR, GPS and DORIS.

Author

Time Series Analysis; Earth Orientation; Computer Programs

20050192503 Bern Univ., Bern, Switzerland

CODE IGS Analysis Center Technical Report 2002

Hugentobler, U.; Schaer, S.; Beutler, G.; Bock, H.; Dach, R.; Jaeggi, A.; Meindl, M.; Urschl, C.; Mervart, L.; Rothacher, M., et al.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 43-51; In English; See also 20050192500; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

CODE, the Center for Orbit Determination in Europe, is a joint venture of the following four institutions: the Federal Office of Topography (swisstopo), Wabern, Switzerland, the Federal Agency of Cartography and Geodesy (BKG), Frankfurt, Germany, the Institut G ographique National (IGN), Paris, France, and the Astronomical Institute of the University of Berne (AIUB), Berne, Switzerland. CODE is located at the AIUB. All solutions and results are produced with the latest development version of the Bernese GPS Software [Hugentobler et al., 2001]. This report covers the time period from January through December 2002. It focuses on major changes taken place in the routine processing during this period and shows new developments and products generated at CODE. The processing strategies used in previous years are described in earlier CODE annual reports [Rothacher et al., 1995, 1996, 1997, 1998, 1999, Hugentobler et al., 2000, 2001]. A wide variety of GPS solutions are computed at CODE. An overview of the products which are made available through anonymous ftp is given. In addition, a regional analysis considering about 50 stations of a sub-network of a European permanent network are processed on a daily basis. Weekly coordinate solutions in SINEX format are regularly delivered to EUREF (European Reference Frame, Subcommission of IAG Commission X). In 2002, no real ultra-rapid orbits were computed at CODE. The solutions delivered to the IGS by CODE were pure predictions on the basis of our daily rapid orbit solutions (i.e., NRT hourly data is not yet considered). Nevertheless the quality of the orbits is entirely competitive with other AC orbit products. The orbits are delivered to the IGS for comparison and are excluded from the IGS ultra rapid orbit combination process but still treated for comparison purposes. The computation of ultra-rapid solutions based on hourly observation data is foreseen for 2003.

Derived from text

Europe; Orbit Determination; Data Processing; Tracking Networks; Geodesy

20050192504 Grupo de Mecanica del Vuelo S.A., Madrid, Spain
IGS LEO Pilot Project
Boomkamp, H.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 213-218; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The International GPS Servuce (IGS) Low Earth Orbiter Pilot Project is concerned with the analysis of data from Low Earth Orbiter (LEO) satellites that are equipped with a GPS receiver. The LEO satellites employ GPS as a tracking system for their own mission objectives, while the IGS LEO Pilot Project aims at investigating possibilities to exploit this LEO GPS data for enhancing the IGS products. With the expected increase in LEO GPS satellites over the present decade, the possible ways of integrating this data in routine IGS processing must be considered with care.
Author
Low Earth Orbits; Global Positioning System; Data Processing

20050192505 European Space Agency. European Space Operations Center, Darmstadt, Germany
The ESA/ESOC IGS Analysis Center
Romero, I.; Dow, J. M.; Zandbergen, R.; Feltens, J.; Garcia, C.; Boomkamp, H.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 243-255; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This report gives an overview of the ESOC Analysis Centre activities and a presentation of the activities during the year 2001. This year the ESOC AC activities have continued uninterrupted and have consolidated with the timely delivery of all the products part of the IGS and participation in several of the IGS Working Groups and Pilot Projects. There have been no major changes to the routine processing during 2001 except for the inclusion in the UltraRapid product of satellite clock bias values (estimated and predicted). Currently ESOC's GPS-TDAF (Tracking and data Analysis Facility) handles automatically the ESA ground receiver network, the IGS network data retrieval and storage and all of the routine daily and weekly data processing of the different IGS products. The system is capable of performing autonomous operations for up to about five days. Information is available on the website: http://nng.esoc.esa.de/gps/gps.html
Derived from text
European Space Agency; Data Processing; Tracking Networks

20050192514 GeoForschungsZentrum, Potsdam, Germany
GFZ Analysis Center of IGS
Gendt, Gerd; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 257-260; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

During 2001 only small changes, which are summarized, were introduced into the analysis. The Ultra Rapid analysis was implemented on a Linux-PC. The performance was very promising, so the complete analysis of a 30-station network takes about half an hour only. By this transition the analysis got independent from the load of the mainframe central computer, which is important to meet the deadlines for the submissions.
Author
Data Processing; Earth Rotation; Satellite Orbits

20050192521 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
JPL IGS Analysis Center Report, 2001-2003
Heflin, M. B.; Bar-Sever, Y. E.; Jefferson, D. C.; Meyer, R. F.; Newport, B. J.; Vigue-Rodi, Y.; Webb, F. H.; Zumberge, J. F.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 65-70; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Three GPS orbit and clock products are currently provided by JPL for consideration by the IGS. Each differs in its latency and quality, with later results being more accurate. Results are typically available in both IGS and GIPSY formats via anonymous ftp. Current performance based on comparisons with the IGS final products is summarized. Orbit performance was determined by computing the 3D RMS difference between each JPL product and the IGS final orbits based on 15 minute

estimates from the sp3 files. Clock performance was computed as the RMS difference after subtracting a linear trend based on 15 minute estimates from the sp3 files.
Author
Global Positioning System; Data Processing; Tracking Networks

20050192529 National Imagery and Mapping Agency, Bethesda, MD, USA
International GLONASS Service: Pilot Project
Slater, James A.; Weber, Robert; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 219-223; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The International GLONASS Service Pilot Project (IGLOS-PP) provided GLONASS observations and precise orbits from a tracking network of over 40 stations and three Analysis Centers for all of 2002. The International Laser Ranging Service (ILRS) also continued to observe three GLONASS satellites during the year. A new Russian launch of three satellites at the end of the year raised the number of available satellites to 10. After keeping the GLONASS data separate from the GPS data in the IGS for the first two years of the project, revisions were made to the IGS Site Logs, Analysis Center software and archival procedures at the Global Data Centers such that the IGLOS tracking data could be merged with the other IGS tracking data in routine operations. The accomplishment of this was a significant milestone.
Author
Global Positioning System; Information Systems; Network Analysis; International Cooperation

20050192530 GeoForschungsZentrum, Potsdam, Germany
TIGA: Tide Gauge Benchmark Monitoring Pilot Project
Schoene, Tilo; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 225-230; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The TIGA Pilot Project was initiated in response to the demanding need for highly precise height coordinates and their changes with time at tide gauge benchmarks. TIGA was formally established during the 16th IGS Governing Board Meeting in Nice (April 2001). For the first time it is not the intention of the IGS to provide results with a very low latency, but to have as many stations included as possible. The primary products of the Pilot Project are time series of coordinates for analyzing vertical motions of Tide Gauges (TG) and Tide Gauge Benchmarks (TGBM). All products will be made public to support and encourage other applications, e.g. sea level studies. In particular, the products of the service will facilitate the distinction between absolute and relative sea level changes by accounting for the vertical uplift of the station, and are, therefore, an important contribution to climate change studies. The service may further contribute to the calibration of satellite altimeters and other oceanographic activities. The pilot project will operate for a period of three years, from 2001 to 2003. After this period the IGS Governing Board will evaluate the project and decide whether or not this activity should become a regular IGS service function.
Author
Altimeters; Coordinates; Measuring Instruments

20050192531 European Space Agency. European Space Operations Center, Darmstadt, Germany
The GPS Receiver Network of ESOC: Maspalomas, Kourou, Kiruna, Perth, Villafranca and Malindi
Garcia, C.; Dow, J. M.; Zandbergen, R.; Feltens, J.; Romero, I.; Perez, J.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 315-318; In English; See also 20050192500; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

During the year 2001 ESOC has continued the plans to upgrade the stations with Ashtech Z-XII receivers. The following summarizes the status and upgrades that took place in 2001: In Kiruna (KIRU) the receiver in operation was an AOA SNR-8100 ACT that was upgraded the previous year (September 2000). In Kourou (KOUR) the Ashtech Z-XII had been upgraded in March 2000. In Malindi (MALI) the Ashtech Z-XII was installed in April 2001 to replace the TurboRogue receiver. Maspalomas (MAS1) was the first ACT upgrade in August 1999, but the new receiver failed some months later and had to be replaced by an Ashtech Z-XII in December 2000. During 2001 the receiver performance was nominal. In Perth (PERT), due to the geographical location, the cross correlation receiver had an acceptable performance and the receiver was only replaced in June 2001 after the failure of the TurboRogue. Villafranca (VILL) was upgraded to an AOA ACT receiver

in July 2000. A similar situation to Maspalomas with a failure of the upgraded receiver some months later made necessary the replacement by an Ashtech Z-XII by the beginning of 2001.
Derived from text
Global Positioning System; Networks; Cross Correlation

20050192532 Academy of Sciences of the Ukraine, Kiev, Ukraine
Status Report of the Ukrainian IGS Stations
Khoda, O.; Savchuk, S.; Stopkhay, Y.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 319-322; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

As of the end of 2001 there are five permanent GPS stations in Ukraine, four of which contribute data to the IGS. 1. Kiev/Golosiiv (4-char ID: GLSV), the first Ukrainian permanent GPS station, operates since December 16, 1997. 2. The new station Poltava (4-char ID) started observations April 26, 2001. 3. The Uzhgorod station (4-char ID: UZHL) started the observations on February 5, 1999. The observations at the new station Lviv (4-char ID: SULP) were started on June 10, 2001.
Derived from text
Global Positioning System; Positioning

20050192533 GeoForschungsZentrum, Potsdam, Germany
IGS Governing Board 1999-2002
Reigher, Christoph; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 3-6; In English; See also 20050192500; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

These two years continue to realize the collective success of the IGS. A key focus of both years has been the IGS Strategic Plan and the process for implementing actions to accomplish the objectives. The key parts of this plan refine the mission, long term goals and objectives of the IGS which are included here. The directions of the IGS as formulated in this plan promise productive and rewarding years to come in this unique global federation of the IGS.
Author
International Cooperation; Global Positioning System

20050192535 Australian National Univ., Australia
Permanent GPS Station LAE1
Tregoning, Paul; Stanaway, Richard; Suat, Job; Hasiata, Suvenia; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 329-331; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The GPS site LAE1 in Lae, Papua New Guinea is the first IGS station in this country and fills a geographical void in the global tracking network in the western Pacific region The successful installation and operation of the site is a result of cooperation several universities: 1. The Department of Surveying and Land Studies at The Papua New Guinea University of Technology, upon whose building the antenna is mounted. Staff installed the site and are responsible for maintaining the continued operation of the GPS equipment and the internet data link. 2. The Research School of Earth Sciences at The Australian National University who provide the Ashtech chokering antenna, cabling, base station software and ongoing support; 3. The University of California, Santa Cruz, who provide the Ashtech Z-XII GPS receiver. The site was first observed in 1996 in support of a national geodetic crustal motion survey. Continuous operation began at LAE1 in July 1997 (day of year 209) and has essentially continued uninterrupted to the present day. An automated, internet-connected download procedure was installed in November 2000 that allowed the data to be transferred directly from Lae to The Australian National University. The site was officially listed as an IGS site in April 2001 and both daily and hourly rinex files for this site have been provided to the IGS since this time.
Derived from text
Global Positioning System; Global Tracking Network; Internets; Data Links

20050192536 Bundesamt fuer Kartographie und Geodaesie, Germany
Analysis and Special Projects within the EPN
Habrich, Heinz; Soehne, Wolfgang; Weber, Georg; Kenyeres, Ambrus; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 279-282; In English; See also 20050192500; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 2001 the 3rd Local Analysis Center (LAC) Workshop took place in Warsaw, Poland. It was settled at that workshop to change some processing options with the beginning of GPS week 1130 to improve the EPN products. The LAC s solutions are fixed to the current ITRF since the same week in order to support the EPN Troposphere Special Project, and a coordinate resubstitution is applied in the final estimation of the hourly troposphere parameters. The ITRF2000 reference frame is used in the EPN analysis since week 1143 according to the changes within the IGS.
Author
Global Positioning System; Geodesy

20050192539 Natural Resources Canada, Ottawa, Ontario, Canada
Reference Frame Working Group
Ferland, R.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 25-33; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Natural Resources Canada s (NRCan) Geodetic Survey Division (GSD), on behalf of the International GPS Service (IGS) and its Reference Frame Working Group, combines a consistent set of station coordinates, velocities, Earth Rotation Parameters (ERP) and apparent geocenter to produce the IGS official station position/ERP solutions in the Software Independent Exchange (SINEX) format. The weekly combination includes solutions from the Analysis Centers (AC), while the Global Networks Associate Analysis Centers (GNAAC) provide quality control. The weekly AC solutions include estimates of weekly station coordinates and daily ERPs. The ACs currently process weekly data from between 40 and 140 stations They also provide separately, satellite orbit and clock estimates as part of their daily products, which are independently but consistently combined by the IGS AC Coordinator to produce the IGS orbit/clock products. The weekly combined station coordinates are accumulated in a cumulative solution containing estimated station coordinates and velocities at a reference epoch. This year activities also included the implementation of the IGS realization of ITRF2000. All the proposed additions/changes are in the Southern Hemisphere, with the main objective being to improve the reference frame (RF) station distribution. In South America, two new stations were added while two old ones were removed. Three other stations were also added; one on Ascension Island in the Atlantic Ocean, one on Diego Garcia Island in the Indian Ocean and one in Australia. The group also participated to two IERS activities; namely, the definition of the SINEX version 2.0 and some analysis of the stability of ERP's. The objectives of the SINEX version 2.0 extensions were to accommodate the requirements of other techniques and the inclusion of the normal equations for multi-techniques combinations.
Author
Data Processing; Earth Resources; Global Positioning System; Geodetic Surveys

20050192540 GeoForschungsZentrum, Potsdam, Germany
Report of the Tropospheric Working Group for 2001
Gendt, Gerd; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 339-344; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Starting in 1997 the IGS Final weekly combined tropospheric product (Gendt, 1996) is now available for more than 5 years. Its internal consistency, obtained by comparing the individual submissions to the combined result, has a standard deviation of 2 to 3 mm in the zenith total delay (ZTD) for most Analysis Centers (AC), where the best ACs are approaching the 2 mm level (see Gendt, 2001). The biases between the individual submissions had stabilized during the past two years, being now in the band of 2 mm (Fig. 1). Recent changes in the analysis strategy by a few ACs gave only small jumps in the bias. The used parameterization is also converging. All but one AC are using now the Niell mapping function. Various elevation cut-off angles are applied (15 degrees by EMR, JPL, NGS; 10 by ESA, SIO; 7 by GFZ; 3 by CODE) with a clear tendency for lower angles.
Derived from text
Troposphere; Standard Deviation; Parameterization

20050192543 Bern Univ., Bern, Switzerland
2001/2002 Analysis Coordinator Report
Weber, R.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 11-24; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This report complements the Analysis Activities Report given in the IGS Annual Report 2001/2002 (Weber, 2003). A summary of the most important model changes and IGS Analysis Activities in 2001/2002 will be presented.
Author
International Cooperation; Global Positioning System

20050192544 Naval Observatory, Washington, DC, USA
IGS/BIPM Time Transfer Pilot Project
Ray, Jim R.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 335-337; In English; See also 20050192500; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The IGS/BIPM Pilot Project to Study Accurate Time and Frequency Comparisons using GPS Phase and Code Measurements is sponsored jointly with the Bureau International des Poids et Measures (BIPM). The project has been underway since early 1998, with the main goal being to investigate and develop operational strategies to exploit geodetic GPS methods for improved global availability of accurate time and frequency comparisons. The respective roles of the IGS and BIPM are complementary and mutually beneficial. The IGS brings a global GPS tracking network, standards for continuously operating geodetic, dual-frequency receivers, an efficient data delivery system, and state-of-the-art data analysis groups, methods, and products. The BIPM and the timing laboratories contribute expertise in high-accuracy metrological standards and measurements, timing calibration methods, algorithms for maintaining stable time scales, and formation and dissemination of UTC.
Derived from text
Global Tracking Network; Metrology; Algorithms; Geodesy

20050192546 Grupo de Mecanica del Vuelo S.A., Madrid, Spain
IGS LEO Pilot Project
Boomkamp, H.; Dow, J. R.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 355-359; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In comparison to ground-based tracking systems like SLR or DORIS, on-board GPS offers the important advantage of continuous tracking coverage of a low Earth orbit, without needing a complex network of tracking stations. To the LEO missions this means that GPS has become an attractive, straightforward tracking system, which is why there will be five operational low Earth orbiting satellites with a GPS receiver on board. To the IGS the LEO can form an orbiting tracking station for the GPS constellation itself that may provide information that is not available from Earth-based stations. The primary goal of the IGS LEO Pilot Project is to explore the ways in which LEO GPS data may enhance the IGS products. The year 2001 marked the release of the first substantial LEO datasets, first from CHAMP and later from the SAC-C mission. Some initial problems with SAC-C lead to a situation where most centers concentrated on the CHAMP data. The orbital height of CHAMP varies from about 450 km just after launch to below 300 km at the end of its operational life (~2006 or later). At this low altitude a satellite is very sensitive to orbit perturbations due to high-degree gravity field harmonics - which illustrates the main mission objective - and due to atmospheric effects. Accordingly, the IGS Associate Analysis Centers that started working on the CHAMP data soon found out that precise orbit determination for such low satellites is much more difficult than it is for the GPS satellites.
Derived from text
Atmospheric Effects; Global Positioning System; Gravitational Fields; Orbit Determination; Orbit Perturbation

20050192548 Belgian Royal Observatory, Brussels, Belgium
Network Operations and Data Flow within the EPN
Bruyninx, Carine; Stangl, Gunter; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 275-278; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The EUREF Permanent Network (EPN) was initiated in 1995 by the IAG sub-commission 'EUREF', responsible for the European Reference Frame. It consists of GPS tracking stations, data centers and analysis centers organized following a similar hierarchy as the IGS and based on voluntary contributions. The EPN has been submitting weekly network solutions to the IGS since May 1996. What makes the EPN Regional Network different from most of the other Regional Networks contributing to the IGS is that the EPN involves a larger number of different agencies (51!). The mutual friendly competition

between the different agencies involved, drives the EPN to meet new challenges, e.g. the EUREF-IP activities. In addition, thanks to its close link with the IGS, the EPN grows hand in hand with the IGS; promoting the IGS standards in Europe and stimulating the European GPS community to evolve together with the IGS.
Derived from text
Tracking Networks; Global Positioning System; Information Flow; Europe

20050192555 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Dual-Wavelength Pumping Creates Gain in the S-Band
Hitz, Breck; Photoics Spectra; July 2005; ISSn 0731-1230; Volume 39, Issue 7, pp. 112-113; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Coarse wavelength division multiplexing is preferable to dense wavelength division multiplexing in many cases because the coarsely multiplexed channels obviate the need for precision wavelength control in sources and passive components. But the optical amplifier that works so well in dense multiplexing - the erbium-doped fiber type - lacks gain over the spectral widths that are required for coarse multiplexing. Many laboratories around the world have investigated thulium-doped fiber amplifiers because they provide gain in the S-band (1460 to 1530 nm) , but the pumping schemes have been complex and inefficient. Recently, an international collaboration investigated what the researchers believe is a more efficient, dual wavelength pumping scheme - one that utilizes readily available and inexpensive diode lasers operating at 690 nm.
Derived from text
Superhigh Frequencies; Ultrahigh Frequencies; Wavelength Division Multiplexing

20050192597 NATO Consultation, Command, and Control Agency, The Hague, Netherlands
Dissemination of ISR Data in the Coalition Aerial Surveillance and Reconnaissance (CAESAR): Results and the Way Ahead
Kreitmair, Thomas; Ross, Joe; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 15-1 - 15-18; In English; See also 20050192588; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In 2001, seven nations developing future Aerospace Ground Surveillance and Reconnaissance (AGS&R) applications initiated the Coalition Aerial Surveillance and Reconnaissance (CAESAR) Project. This paper is focused on AGS&R, which provides a substantial subset of the overall Intelligence Surveillance and Reconnaissance (ISR) effort. The findings presented in this paper are based on a set of exercises conducted from project inception up to June 2004. Several AGS&R architectures were tested with numerous sensor and exploitation capabilities providing support. The sensors applied included JSTARS, ASTOR, HORIZON, CRESO, GLOBAL HAWK and RADARSAT-2. These sensors were used to provide Ground Moving Target Indicator (GMTI) data, Synthetic Aperture Radar (SAR) images and Link 16 Ground Tracks to airborne and ground based exploitation stations. Within the AGS&R architecture, various data streams are stored and made accessible through a CAESAR Shared Database (CSD), which supports network centric operations. Some of the features of the CSD are explained. The Multi-Sensor Aerospace-Ground Joint Interoperable Intelligence Surveillance and Reconnaissance Coalition (MAJIIC) project will expand on the findings of CAESAR in the years 2005 to 2009.
Author
Aerial Reconnaissance; Space Surveillance (Spaceborne); Space Surveillance (Ground Based); Synthetic Aperture Radar; Intelligence; Radarsat; Radar Imagery

20050192604 Swedish Defence Research Establishment, Linkoeping, Sweden
High-Resolution Environment Models to Support Rapid and Efficient Mission Planning and Training
Ahlberg, Simon; Soederman, Ulf; Persson, Asa; Elmqvist, Magnus; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 5-1 - 5-12; In English; See also 20050192588; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Modern conflict situations set new requirements for mission planning and mission rehearsal systems Rapid and appropriate reactions to new situations require updated geographic information and intelligence information about the area of interest. In many cases, this information is inaccurate, outdated or even unavailable. Therefore, new data acquisition and automatic processing methods are required. In this paper we present recent results from the Sensor Technology Division of the Swedish Defence Research Agency, where we have developed new methods for extracting terrain features from high resolution laser radar data and imager from airborne platforms. By using modern high-resolution sensors and new automatic

sensor data processing methods, we are able to produce data that can be used in C2 systems for mission planning and for building realistic virtual training environments to gain mission critical local knowledge about the area of operations.
Author
Environment Models; Mission Planning; Intelligence; High Resolution; Education; Terrain; Radar Data; Optical Radar

20050194569 NASA Langley Research Center, Hampton, VA, USA
Graphical Analysis of Electromagnetic Coupling on B-737 and B-757 Aircraft for VOR and LOC IPL Data
Jafri, Madiha; Ely, Jay; Vahala, Linda; [2005]; 4 pp.; In English; 2005 IEEE/ACES International Conference on Wireless Communications and Applied Computational Electromagnetics, 3-7 Apr. 2005, Honolulu, HI, USA; Original contains color illustrations
Contract(s)/Grant(s): 23-079-30-10; No Copyright; Avail: CASI; A01, Hardcopy

Electromagnetic coupling measurements were performed from numerous passenger cabin locations to aircraft instrument landing system localizer (LOC) and VHF Omni-Ranging (VOR) systems. This paper presents and compares the data for B-757 and B-737 airplanes, and provides a basis for fuzzy modeling of coupling patterns in different types of airplanes and airplanes with different antenna locations.
Author
Boeing 737 Aircraft; Boeing 757 Aircraft; Electromagnetic Coupling; Instrument Landing Systems; Vhf Omnirange Navigation; Computer Graphics

20050195835 NASA Glenn Research Center, Cleveland, OH, USA
Seven Years of ACTS Technology Verification Experiments Reviewed
Acosta, Roberto J.; Johnson, Sandra K.; McEntee, Kathleen M.; Gauntner, William; Feliciano, Walber; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Advanced Communications Technology Satellite (ACTS) was designed to achieve a 99.5-percent system availability rate and signals with less than one error in 10(exp 7) bits throughout the continental USA. To accomplish such a high rate of system availability, ACTS uses multiple narrow hopping beams and very small aperture terminal (VSAT) technology. In addition, ACTS uses an adaptive rain fade compensation protocol to reduce the negative effects of propagation on the system. To enhance knowledge on how propagation and system variances affect system availability, researchers at the NASA Glenn Research Center at Lewis Field performed technology verification experiments over a 7-yr period (from September 1993 to the present). These experiments include T1VSAT System Availability, Statistical Rain Fade Compensation Characterization, Statistical Characterization of Ka-Band Propagation Effects on Communication Link Performance, and Multibeam Antenna Performance.
Author
ACTS; System Effectiveness; Reliability Analysis; Communication Equipment; Data Transmission

20050195841 NASA Glenn Research Center, Cleveland, OH, USA
Antennas Designed for Advanced Communications for Air Traffic Management (AC/ATM) Project
Zakrajsek, Robert J.; Research and Technology 1999; March 2000; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The goal of the Advanced Communications for Air Traffic Management (AC/ATM) Project at the NASA Glenn Research Center at Lewis Field is to enable a communications infrastructure that provides the capacity, efficiency, and flexibility necessary to realize a mature free-flight environment. The technical thrust of the AC/ATM Project is targeted at the design, development, integration, test, and demonstration of enabling technologies for global broadband aeronautical communications. Since Ku-band facilities and equipment are readily available, one of the near-term demonstrations involves a link through a Kuband communications satellite. Two conformally mounted antennas will support the initial AC/ATM communications links. Both of these are steered electronically through monolithic microwave integrated circuit (MMIC) amplifiers and phase shifters. This link will be asymmetrical with the downlink to the aircraft (mobile vehicle) at a throughput rate of greater than 1.5 megabits per second (Mbps), whereas the throughput rate of the uplink from the aircraft will be greater than 100 kilobits per second (kbps). The data on the downlink can be narrow-band, wide-band, or a combination of both, depending on the requirements of the experiment. The AC/ATM project is purchasing a phased-array Ku-band transmitting antenna for the uplink from the test vehicle. Many Ku-band receiving antennas have been built, and one will be borrowed for a short time to perform the initial experiments at the NASA Glenn Research Center at Lewis Field. The Ku-band transmitting antenna is a 254-element MMIC phased-array antenna being built by Boeing Phantom Works. Each element can radiate 100

mW. The antenna is approximately 43-cm high by 24-cm wide by 3.3-cm thick. It can be steered beyond 60 from broadside. The beamwidth varies from 6 at broadside to 12 degrees at 60 degrees, which is typical of phased-array antennas. When the antenna is steered to 60 degrees, the beamwidth will illuminate approximately five satellites on the orbital arc. Spread spectrum techniques will be employed to keep the power impinging on the adjacent satellites below their noise floor so that no interference results. This antenna is power limited. If the antenna elements (currently 254) are increased by a factor of 4 (1024) or 16 (4096), the gain will increase and the beamwidth will decrease in proportion. For the latter two antenna sizes, the power must be 'backed off' to prevent interference with the neighboring satellites. The receiving antenna, which is approximately 90-cm high, 60-cm wide, and 3.5-cm thick, is composed of 1500 phased-array elements. The system phased-array controller can control both a 1500-element receiving antenna and a 500-element transmitting antenna. For ground testing, this controller will allow manual beam pointing and polarization alignment. For normal operation, the system can be connected to the receiving antenna and the navigation system for real-time autonomous track operation. This will be accomplished by first pointing both antennas at the satellite using information from the aircraft data bus. Then, the system phased-array controller will electronically adjust the antenna pointing of the receiving antenna to find the peak signal. After the peak signal has been found, the beam of the transmitting antenna will be pointed to the same steering angles as the receiving antenna. For initial ground testing without an aircraft, the ARINC 429 data bus (ARINC Inc., Annapolis, Maryland) will be simulated by a gyro system purchased for the follow-on to the Monolithic Microwave Integrated Circuit (MMIC) Arrays for Satellite Communication on the Move (MASCOM) Project. MASCOM utilized the Advanced Communications Technology Satellite (ACTS) with a pair of Ka-band experimental phased-array antennas.
Author
Air Traffic Control; Antenna Design; Communication Satellites; Autonomy

20050195885 NASA Glenn Research Center, Cleveland, OH, USA
Internet-Protocol-Based Satellite Bus Architecture Designed
Slywczak, Richard A.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

NASA is designing future complex satellite missions ranging from single satellites and constellations to space networks and sensor webs. These missions require more interoperability, autonomy, and coordination than previous missions; in addition, a desire exists to have scientists retrieve data directly from the satellite rather than a central distribution source. To meet these goals, NASA has been studying the possibility of extending the Transmission Control Protocol/Internet Protocol (TCP/IP) suite for spacebased applications.
Derived from text
Internets; Protocol (Computers); Webs; Architecture (Computers)

20050196145 Air Force Flight Test Center, Edwards AFB, CA USA
Data Communications Over Aircraft Power Lines
Tian, Hal; Trojak, Tom; Jones, Charles; Jun. 2005; 12 pp.; In English
Contract(s)/Grant(s): F04700-02-D-0005
Report No.(s): AD-A435026; AFFTC-PA-05139; XC-412/TW/ENTI; No Copyright; Avail: CASI; A03, Hardcopy

This paper introduces a study of the feasibility and initial hardware design for transmitting data over aircraft power lines. The intent of this design is to significantly reduce the wiring in the aircraft instrumentation system. The potential usages of this technology include Common Airborne Instrumentation System (CAIS) or clock distribution. Aircraft power lines channel characteristics are presented and Orthogonal Frequency Division Multiplexing (OFDM) is introduced as an attractive modulation scheme for high-speed power line transmission. A design of a full-duplex transceiver with accurate frequency planning is then discussed. A general discussion of what communications protocols are appropriate for this technology is also provided.
DTIC
Communication Cables; Data Transmission; Power Lines

20050196255 Northwestern Univ., Evanston, IL USA
Cross-Layer Wireless Resource Allocation
Berry, Randall A.; Yeh, Edmund M.; Jun. 2005; 11 pp.; In English
Contract(s)/Grant(s): DAAD19-03-1-0229; CCR-0313329
Report No.(s): AD-A435199; ARO-45187.5-CI-YIP; No Copyright; Avail: Defense Technical Information Center (DTIC)

A fundamental problem in networking is the allocation of limited resources among the users of the network. In a traditional layered network architecture, the resource to be allocated at the medium access control (MAC) and network layers is the use of communication links, viewed as 'bit pipes' that deliver data at a fixed rate with occasional random errors. This bit pipe is a simple abstraction of the underlying physical and data link layers. There is growing awareness that this simple bit-pipe view is inadequate, particularly in the context of modern wireless data networks. Indeed, as highlighted throughout this issue, significant performance gains can be achieved by various cross-layer approaches, i.e., approaches that jointly consider physical layer and higher networking layer issues in an integrated framework. In this article, we consider several basic cross-layer resource allocation problems for wireless fading channels. Here, the resources to be allocated include the transmission power and rate assigned to each user. In modern wireless systems, a variety of link adaptation techniques such as adaptive modulation and coding or variable rate spreading are employed that enable a user's data rate to be adapted over time based in part on time varying channel fading. This results in a physical layer that is no longer well modeled as a fixed-rate bit pipe; instead, a much richer abstraction is required. In this setting, our focus is on characterizing fundamental performance limits, taking into account both network layer QoS and physical layer performance. We note that at the physical layer, fundamental communication limits established by information theory are, in many cases, well understood. However, when higher-layer objectives such as delay are taken into account, much less is known about fundamental performance tradeoffs. The problems surveyed in this article are attempts to address such basic questions.
DTIC
Electromagnetic Interference; Fading; Multichannel Communication; Resource Allocation; Resources Management; Wireless Communication

20050196616 NASA Glenn Research Center, Cleveland, OH, USA
Ferroelectric/Semiconductor Tunable Microstrip Patch Antenna Developed
Romanofsky, Robert R.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A lithographically printed microwave antenna that can be switched and tuned has been developed. The structure consists of a rectangular metallic 'patch' radiator patterned on a thin ferroelectric film that was grown on high-resistivity silicon. Such an antenna may one day enable a single-phased array aperture to transmit and receive signals at different frequencies, or it may provide a simple way to reconfigure fractal arrays for communications and radar applications.
Derived from text
Ferroelectricity; Semiconductors (Materials); Microwave Antennas

20050196618 NASA Glenn Research Center, Cleveland, OH, USA
High-Efficiency Wide-Band Suspended Patch Antenna Array Demonstrated
Simons, Rainee N.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A four-element, suspended patch antenna array that has a parasitic patch layer on top and is electromagnetically coupled to an inverted microstrip feed for linear polarization was demonstrated at K-band frequencies. The layout of the array is shown in the following figure. The antenna has the following advantages over conventional microstrip antennas: 1. The inverted microstrip has lower losses, which result in higher gain and efficiency. 2. The inverted microstrip is easier to fabricate, because the strip width is wider for a given characteristic impedance. 3. A conventional proximity-coupled patch antenna requires a substrate for the feed and a superstrate for the patch. However, the inverted microstrip-fed patch antenna makes use of a single substrate and, hence, is lightweight and inexpensive. 4. Electromagnetic coupling results in a wider bandwidth.
Derived from text
Antenna Arrays; Broadband; Fabrication; Microstrip Antennas; Patch Antennas

20050196619 NASA Glenn Research Center, Cleveland, OH, USA
Microelectromechanical Systems (MEMS) Actuator for Reconfigurable Patch Antenna Demonstrated
Simons, Rainee N.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A microstrip patch antenna with two contact actuators along the radiating edges for frequency reconfiguration was demonstrated at K-band frequencies. The layout of the antenna is shown in the following figure. This antenna has the following advantages over conventional semiconductor varactor-diode-tuned patch antennas: 1. By eliminating the semiconductor diode and its nonlinear I-V characteristics, the antenna minimizes intermodulation signal distortion. This is

particularly important in digital wireless systems, which are sensitive to intersymbol interference caused by intermodulation products. 2. Because the MEMS actuator is an electrostatic device, it does not draw any current during operation and, hence, requires a negligible amount of power for actuation. This is an important advantage for hand-held, battery-operated, portable wireless systems since the battery does not need to be charged frequently. 3. The MEMS actuator does not require any special epitaxial layers as in the case of diodes and, hence, is cost effective.
Derived from text
Microelectromechanical Systems; Actuators; Microstrip Antennas; Intermodulation

20050196739 Department of Justice, Washington, DC, USA
U.S. Department of Justice Office of Inspector General Report to Congress on Implementation of Section 1001 of the USA Patriot Act (as required by Section 1001(3) of Public Law 107-56)
Jan. 2004; 26 pp.; In English
Report No.(s): PB2005-109060; No Copyright; Avail: CASI; A03, Hardcopy
Section 1001 of the USA PATRIOT Act (Patriot Act), Public Law 107-56, directs the Office of the Inspector General (OIG) in the U.S. Department of Justice (DOJ or Department) to undertake a series of actions related to claims civil rights or civil liberties violations allegedly committed by DOJ employees. also requires the OIG to provide semiannual reports to Congress on the implementation of the OIGs responsibilities under Section 1001. This report fourth since enactment of the legislation in October 2001 summarizes the OIGs Section 1001-related activities from June 16, 2003, through December 15, 2003.
NTIS
Congressional Reports; Intelligence; Law (Jurisprudence); Public Law; Terrorism

20050196740 Department of Justice, Washington, DC, USA
Department of Justice Office of Inspector General Report to Congress on Implementation of Section 1001 of the USA Patriot Act (as required by Section 1001(3) of Public Law 107-56). March 2005
Mar. 2005; 24 pp.; In English
Report No.(s): PB2005-109059; No Copyright; Avail: CASI; A03, Hardcopy
Section 1001 of the USA PATRIOT Act (Patriot Act), Public Law 107-56, directs the Office of the Inspector General (OIG) in the U.S. Department of Justice (DOJ or Department) to undertake a series of actions related to claims civil rights or civil liberties violations allegedly committed by DOJ employees. also requires the OIG to provide semiannual reports to Congress on the implementation of the OIGs responsibilities under Section 1001. This report sixth since enactment of the legislation in October 2001 summarizes the OIGs Section 1001-related activities from June 22, 2004, through December 31, 2004.
NTIS
Congressional Reports; Intelligence; Law (Jurisprudence); Public Law; Terrorism

20050196756 General Accounting Office, Washington, DC, USA
Defense Acquisitions: Resolving Development Risks in the Army's Networked Communications Capabilities Is Key to Fielding Future Force
Jun. 2005; 50 pp.; In English
Report No.(s): PB2005-108327; GAO-05-669; No Copyright; Avail: CASI; A03, Hardcopy
The Army has embarked on a major transformation of its force. Central to this transformation is the Future Combat Systems (FCS), a $108 billion effort to provide warfighters with the vehicles, weapons, and communications needed to identify and respond to threats with speed, precision, and lethality. Establishing reliable, robust communications and networking capabilities is key to FCS's success. Each of the systems integral to the FCS communications network- the Joint Tactical Radio System (JTRS), the Warfighter Information Network-Tactical (WIN-T), and the System of Systems Common Operating Environment (SOSCOE)-rely on significant advances in current technologies and must be fully integrated to realize FCS. Given the complexity and costs of this undertaking, GAO was asked to review each of these key development efforts to identify any risks that may jeopardize the successful fielding of FCS.
NTIS
Communication Networks; Radio Communication; Telecommunication; Military Operations

20050196805 Raytheon Co., USA, Chemfab Corp., USA, NASA Glenn Research Center, Cleveland, OH, USA
Biaxial Testing of High-Strength Fabric Improves Design of Inflatable Radar Domes
Krause, David L.; Bartolotta, Paul A.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Large radar installations around the globe continuously watch the skies, unobtrusively providing security to the USA; these systems have been in active use for the past 50 years. Often situated in extreme environments, the radar dishes require shielding from the harsh elements. Air-inflated domes (over 100 ft in diameter) are one structure of choice for providing this essential protection. The radomes are constructed from highstrength fabric that is strong enough to withstand the inflation pressure, high winds, and other environmental loads, yet transparent to the microwave signal to allow precise radar mapping. This fabric is woven from glass fibers for high strength and embedded in a polytetrafluoroethylene resin matrix, akin to the nonstick coatings used on cookware.
Derived from text
Radar; Surveillance Radar; Fiber Strength

20050199440 NASA Glenn Research Center, Cleveland, OH, USA
Phased-Array Satcom Antennas Developed for Aeronautical Applications
Kerczewski, Robert J.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Advanced Communications (AC) for Aeronautics research at the NASA Glenn Research Center integrates both aeronautics and space communications technologies to achieve the national objective of upgrading the present National Airspace System infrastructure by responding to the agency's aviation capacity and safety goals. One concept for future air traffic management, free flight, presents a significantly increased demand for communications systems capacity and performance in comparison to current air traffic management practices. Current aeronautical communications systems are incapable of supporting the anticipated demands, and the new digital data communications links that are being developed, or are in the early stages of implementation, are not primarily designed to carry the data-intensive free flight air traffic management (ATM) communications loads. Emerging satellite communications technologies are the best potential long-term solution to provide the capacity and performance necessary to enable a mature free flight concept to be deployed. NASA AC/ATM funded the development of a Boeing-designed Ku-band transmit phased-array antenna, a combined in-house and contract effort. Glenn designed and integrated an Aeronautical Mobile Satellite Communications terminal based on the transmit phased-array antenna and a companion receive phased-array antenna previously developed by Boeing.
Derived from text
Antenna Arrays; Satellite Communication; Aeronautical Satellites

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ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20050188558 Signal Science, Inc., Rochester, NY USA
Ultra-low Power Sentry for Ambient Powered Smart Sensors
Moule, Eric; Bocko, Mark; May 2005; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-04-M-0049
Report No.(s): AD-A433896; No Copyright; Avail: Defense Technical Information Center (DTIC)

The basic circuit operation of the power sentry system was presented previously in the 3rd Quarterly Report, but it has been updated and included again as a reminder. The proposed power sentry system requires several components to realize the signal processing technique for monitoring a sensor output to detect the presence of signals with defined frequency and amplitude properties. In this section, each component's role within the system will be described to provide a general understanding of how the implemented circuit design performs the desired function.
DTIC
Detection; Low Frequencies; Signal Processing

20050188566 Space and Naval Warfare Systems Center, San Diego, CA USA
Thermal Pixel Array Characterization for Thermal Imager Test Set Applications
Bendall, Ike; Michno, Ted; Williams, Don; Holck, Matthew; Bates, Richard; Lopez-Alonso, Jose M.; Giannaris, Robert J.; Perkins, Gordon; Marlin, H. R.; Aug. 2001; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434119; No Copyright; Avail: CASI; A02, Hardcopy

An array of thermal emitters has been developed for use in a portable test set to enable field testing of low-performance infrared imaging systems and seekers. It is not known if this technology can be used to evaluate the performance of state-of-the-art thermal imagers. This paper describes the preliminary measurements of thermal pixel array (TPA) performance. The radiant output of TPA was measured as a function of pattern size and drive voltage. Simple models were developed that agree with many aspects of the experimental data. Spatial and temporal noise characteristics of the TPA have been ascertained through three-dimensional noise analysis. Detection algorithms were used to compare images of test patterns produced by the TPA to images of similar test patterns produced by a standard blackbody.
DTIC
Black Body Radiation; Characterization; Infrared Detectors; Infrared Imagery; Pattern Recognition; Pixels; Thermal Mapping

20050188578 Space and Naval Warfare Systems Center, San Diego, CA USA
A Real-Time Infrared Scene Simulator in CMOS/SOI MEMS
Popp, Jeremy D.; Offord, Bruce; Bates, Richard; Marlin, H. R.; Hutchens, Chris; Huang, Derek; Aug. 2001; 4 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434189; No Copyright; Avail: CASI; A01, Hardcopy

A 64 x 128 real-time infrared (RTIR) complementary metal-oxide semiconductor (CMOS)/silicon-on-insulator (SOI) scene generation integrated circuit (IC) is described. The RTIR IC offers real-time dynamic thermal scene generation. This system is a mixed-mode design, with analog scene information written and stored into a thermal pixel array. The design uses micro-electromechanical sensors (MEMS) in conjunction with SSC San Diego's 0.8-micrometer CMOS/SOI process to develop a RTIR IC scene generator. The objective of this RTIR project is to develop a reliable prototype infrared (IR) test set for use in calibration and testing of IR systems, including built-in-test to ensure the real-time reliability of IR sensing systems. The potential of RTIR as built-in-test equipment (BITE) is to improve the reliability of IR sensors, thus lowering the overall system cost of operation. Infrared scene simulators that use bulk CMOS/MEMS have been reported previously; however, this work uses SOI as the starting material. The MEMS area is scaled down to create higher density pixel arrays, with low leakage at higher temperatures.
DTIC
CMOS; Infrared Detectors; Infrared Radiation; Integrated Circuits; Microelectromechanical Systems; Pixels; Real Time Operation; Scene Generation; Simulators

20050188582 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Optical Investigation of Transition Metal Implanted Wide Band Gap Semiconductors
Feller, Brian P.; Mar. 2005; 60 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434194; AFIT/GEO/ENP/05-02; No Copyright; Avail: CASI; A04, Hardcopy

Thin films of GaN, Al(sub 0.1)Ga(sub 0.9)N, and ZnO were implanted with Cr, Mn, and nickel Ni to produce dilute magnetic semiconductors. Optical and magnetic techniques were used to evaluate crystal structure restoration and coercive field strength as a function of implant species and annealing temperature. Maximum crystal restoration was obtained for Al(sub 0.1)Ga(sub 0.9) N after annealing at 675 C; for Cr implanted p-GaN after annealing at 750 C; for Mn or Ni implanted p-GaN after annealing at 675 C; for Cr implanted ZnO after annealing at 700 C; for Mn implanted ZnO after annealing at 675 C; and for Ni implanted ZnO after annealing at 650 C. Maximum coercive field strengths were found for Cr implanted Al(sub 0.1)Ga(sub 0.9)N after annealing at 750 C; for Mn implanted Al(sub 0.1)Ga(sub 0.9)N after annealing at 675 C; for Ni implanted Al(sub 0.1)Ga(sub 0.9)N after annealing at 700 C; for Cr or Mn implanted p-GaN after annealing at 725 C; for Ni implanted p-GaN after annealing at 675 C; for Cr or Ni implanted ZnO after annealing at 725 C; and for Mn implanted ZnO after annealing at 725 C. Optimum annealing conditions for optical and magnetic properties of the implanted wide band gap semiconductors agree with each other very well.
DTIC
Annealing; Broadband; Energy Gaps (Solid State); Magnetic Materials; Optical Properties; Optical Transition; Semiconductors (Materials); Thin Films; Transition Metals

20050188600 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Temperature Dependent Current-Voltage Measurements of Neutron Irradiated A10.27Ga0.73N/GaN Modulation Doped Field Effect Transistors

Uhlman, Troy A.; Mar. 2005; 189 pp.; In English

Report No.(s): AD-A434221; AFIT/GNE/ENP/05M-16; No Copyright; Avail: CASI; A09, Hardcopy

In this research, the first ever neutron irradiation study of AlGaN/GaN MODFETs was conducted. Devices irradiated to a total 1 MeV Eq (Si) neutron fluence of 1.2x10^16 n/sq cm demonstrated the temperature dependence of irradiation and annealing. Devices irradiated at 80 K exhibited significant persistent electrical degradation at only 5.4 rad (Si), whereas those irradiated at elevated temperatures exhibit transient increases in gate and drain current up to 400 krad (Si). I-V measurements indicate substantial radiation-induced increased gate and drain currents occur only at low-temperature irradiations. The introduction of a high-density of donor defects is hypothesized as the primary cause of both increased values. Irradiating at temperatures \g 300 K effectively reduces total accumulated dose effects even at 400 krad(Si). Further analysis of the Schottky contacts has determined that the devices are field-emission and defect-assisted tunneling dominated at all temperatures. The Schottky diode parameters were extracted using a novel six-parameter fitting routine. To the authors knowledge this is the first application of such theory on AlGaN/GaN MODFETs.

DTIC

Aluminum Nitrides; Doped Crystals; Electrical Measurement; Field Effect Transistors; Gallium Nitrides; Irradiation; Low Temperature; Modulation; Neutron Irradiation; Neutrons; Temperature Dependence

20050188607 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Detection of Residual Stress in SiC MEMS Using micro-Raman Spectroscopy

Zingarelli, John C.; Mar. 2005; 137 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434229; AFIT/GEO/ENP/05-06; No Copyright; Avail: CASI; A07, Hardcopy

Micro-Raman (mu-Raman) spectroscopy is used to measure residual stress in two silicon carbide (SiC) poly-types: single-crystal, hexagonally symmetric 6H-SiC, and polycrystalline, cubic 3C-SiC thin films deposited on Si substrates. Both are used in micro-electrical-mechanical systems (MEMS) devices. By employing an incorporated piezoelectric stage with submicron positioning capabilities along with the Raman spectral acquisition, spatial scans are performed to reveal areas in the 6H-SiC MEMS structures that contain residual stress. Shifts in the transverse optical (TO) Stokes peaks of up to 2 cm^-1 are correlated to the material strain induced by the MEMS fabrication process through the development of phonon deformation potential curves for this material. The 3C-SiC films, with thicknesses ranging from 1.5-5 microns, are deposited by CVD on (100) Si substrates and are also investigated to determine their residual stress. An ultraviolet excitation source (lambda = 325 nm, hv = 3.82 eV) was determined to be more effective for the detection of Raman shifts in these thin films than the 514-nm source, since the absorption coefficient in SiC at 300 K at 325 nm is 3660 cm-1, while that at 514 nm is less than 100 cm-1.

DTIC

Detection; Microelectromechanical Systems; Raman Spectroscopy; Residual Stress; Silicon Carbides; Stress Measurement

20050188616 Space and Naval Warfare Systems Center, San Diego, CA USA

Silicon-on-Sapphire Technology: A Competitive Alternative for RF Systems

Lagnado, Isaac; Houssaye, Paul R. de la; Koester, S. J.; Hammond, R.; Chu, J. O.; Ott, J. A.; Mooney, P. M.; Perraud, L.; Jenkins, K. A.; Aug. 2001; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434243; No Copyright; Avail: CASI; A02, Hardcopy

The authors investigated the formation of high-performance, device-quality, thin-film silicon (30 to 50 nm) on sapphire (TFSOS) for application to millimeter-wave communication and sensors. The resulting TFSOS, obtained by Solid Phase Epitaxy (SPE), and the growth of strained silicon-germanium (SiGe) layers on these TFSOS demonstrated enhanced devices and integrated circuit performance not achieved previously. The authors fabricated 250-nm and 100-nm T-gated devices with noise figures as low as 0.9 dB at 2 GHz and 2.5 dB at 20 GHz, with G(sub a) of 21 dB and 7.5 dB, respectively. The 250-nm devices resulted in distributed wideband amplifiers (10-GHz bandwidth BW, world record) and tuned amplifiers (15-dB, 4-GHz BW). The 100-nm devices produced voltage-controlled oscillators (VCOs) (25.9-GHz), 30-GHz frequency dividers. They also obtained f(sub t) (f (sub max)) of 105 GHz (50 GHz) for n-channel and 49 GHz (116 GHz, world record) for p-MODFETs (strained Si(0.2)Ge(0.8) on a relaxed Si(0.7)Ge(0.3) hetero-structure). This paper details the investigation and provides cost comparisons with competing technologies.

DTIC

Field Effect Transistors; Germanium; Microwave Equipment; Millimeter Waves; Radio Frequencies; Sapphire; Silicon; Sos (Semiconductors); Thin Films

20050188677 Phillips Lab., Hanscom AFB, MA USA
An Overview of Lattice-Gas Dynamics
Yepez, Jeffrey; Nov. 1997; 45 pp.; In English
Report No.(s): AD-A434329; No Copyright; Avail: Defense Technical Information Center (DTIC)

One can argue it is the case that the fundamental nature of the physical world is that it is quantized in such a way that phasespace is granular, and one can observe that digital computation is discrete and granular too. Given these similarities, one might try to see just how far one can go in 'connecting' the two. In this regard, Richard Feynman gave a talk entitled 'Simulating Physics with Computers' in 1981: 'I want to talk about the possibility that there is to be an exact simulation, that the computer will do exactly the same as nature. If this is to be proved..., then it's going to be necessary that everything that happens in a finite volume of space and time would have to be exactly analyzable with a finite number of logical operations. The present theory of physics is not that way, apparently. It allows space to go down into infinitesimal distances, wavelengths to get infinitely great, terms to be summed to infinite order, and so forth...' In this seminal talk and in subsequent papers 27, 28, Feynman discussed an interesting possibility: the possibility of constructing a quantum computer to simulate quantum mechanics.
DTIC
Gas Dynamics; Lattice Vibrations; Molecular Dynamics

20050188692 Carnegie-Mellon Univ., Pittsburgh, PA USA
Application-Specific Integrated-Microelectromechanical Systems (MEMS) process Services (ASIMPS)
Fedder, Gary K.; Gabriel, Kaigham J.; Maher, Mary A.; Mukherjee, Tamal; Apr. 2005; 69 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-99-2-0545; DARPA ORDER-J346; Proj-E117
Report No.(s): AD-A434350; AFRL-IF-RS-TR-2005-140; No Copyright; Avail: CASI; A04, Hardcopy

The primary goal of this project was to develop the technology for an application-specific integrated microelectromechanical systems (MEMS) process service, called ASIMPS. Multiple government, industry and academic institutions participated in seven integrated MEMS process runs. Layout rules, design practices and tutorials for integrated MEMS were generated. Microelectromechanical structures were made from the interconnect layers within commercial foundry integrated circuit processes. The post-foundry micromachining process comprised dry etching of the dielectric layers, then a deep-reactive-ion etch of silicon followed by an isotropic silicon undercut to release the structures. An alternate fabrication flow was explored that created single-crystal silicon structures within the foundry processes. Microdevices included accelerometers, gyroscopes, vibratory magnetometers, microphones, microspeakers, scanning mirrors, high quality factor inductors, and tunable capacitors. In particular, microaccelerometers were developed with resolution limited by brownian noise. Millimeter-sized mirrors in the single-crystal silicon process were developed for laser scanning applications. Microspeakers and microphone designs that exploit a unique mesh membrane sealed with polymer were successfully transferred to industry.
DTIC
Fabrication; Microelectromechanical Systems; Systems Integration

20050188725 Florida Univ., Shalimar, FL USA
Optically Assisted High-Speed, High Resolution Analog-to-Digital Conversion
Zmuda, Henry; Apr. 2005; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-03-2-0219; Proj-528D
Report No.(s): AD-A434404; AFRL-SN-RS-TR-2005-154; No Copyright; Avail: CASI; A03, Hardcopy

An approach that modifies an analog fiber optic link with a recirculating optical loop as a means to realize a high-speed, high-resolution Analog-to-Digital Converter (ADC) is presented. The loop stores a time-limited microwave signal so that it may be digitized by using a slower, conventional electronic ADC. Detailed analytical analysis of the dynamic range and noise figure shows that under appropriate conditions the microwave signal degradation is sufficiently small so as to allow the digitization of a multi-gigahertz signal with a resolution greater than 10 effective bits. Experimental data is presented which shows that a periodic extension of the input signal can be sustained for well over one hundred periods that in turn suggests an electronic ADC speed-up factor of over 100. The data also shows that polarization effects must be carefully managed to inhibit the loops tendency to lase even though the loop itself contains no frequency-selective elements.
DTIC
Analog to Digital Converters; High Resolution; High Speed

20050188777 Michigan Univ., Ann Arbor, MI USA
Three-Dimensional THz Imaging
Norris, Theodore B.; Apr. 2005; 20 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0389
Report No.(s): AD-A434536; AFRL-SR-AR-TR-05-0236; No Copyright; Avail: CASI; A03, Hardcopy

Three-dimensional imaging has been demonstrated using a single-cycle terahertz electromagnetic pulses. Reflection-mode imaging was performed with photoconductive transmitter and receiver and a reconstruction algorithm based on time reversal. A two-dimensional array was synthesized from ten concentric ring annular arrays with numerical apertures ranging from 0.27 to 0.43. The system clearly distinguished image planes separated by 1.5 mm and achieved a lateral resolution of 1.1 mm. In terms of the illuminating terahertz power spectrum, the lateral resolution was 28% and 81% of the peak and mean wavelengths, respectively, Coded excitation has also been explored to improve the signal-to-noise ratio. A separate imaging system was constructed, where a 54-bit binary waveform is transmitted while the received signals are digitally compressed. Two-dimensional objects have been imaged with a 13 dB improvement in signal-to-noise ratio.
DTIC
Diffraction; Electromagnetic Pulses; Electro-Optics; Imaging Techniques; Infrared Imagery; Tomography

20050188829 Pro-Tech, Alamo, CA USA
Conformal Impulse Receive Antenna Arrays
Giri, D. V.; Casey, K. F.; Skipper, M. C.; Abdalla, M. D.; Feb. 2005; 51 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9451-04-M-0081; Proj-3005
Report No.(s): AD-A434641; AFRL-DE-PS-TR-2005-1030; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report addresses the design and fabrication of a prototype transient multi-element planar array operating in an impulse regime. The objective is to develop a conformal impulse 'timed-array' antenna, operating in a transient regime and covering a wide frequency band spanning an approximately 200 MHz-2 GHz range. Under this Phase-I effort, we have analytically formulated the receiving characteristics of a hyperband antenna array. In addition, a mock-up four element conformal antenna was built and evaluated. The antenna utilizes a nylon substrate. The results indicate that the theoretical basis for the antenna is valid and that some simple improvements can be done to substantially improve the performance.
DTIC
Antenna Arrays; Impulses

20050188837 Farr Research, Inc., Albuquerque, NM USA
A Conical Slot Antenna and Related Antennas Suitable for Use with an Aircraft with Inflatable Wings
Farr, Everett G.; Bigelow, W. S.; Feb. 2005; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9451-04-M-0080; Proj-3005
Report No.(s): AD-A434746; AFRL-DE-PS-TR-2005-1043; No Copyright; Avail: Defense Technical Information Center (DTIC)

Airborne UWB radar systems require receive antennas that can be printed or mounted onto an inflatable wing. Such antennas need to reach as low as VHF frequencies, and must be positioned to look to the side of the aircraft. To satisfy these requirements, a tapered slot antenna (TSA) looking off the wingtip has been proposed. However, a conventional TSA receives only horizontal polarization. Here, we describe a new form of TSA, the conical slot antenna (CSA), which exhibits vertical polarity above and below the horizon. to test the approach, we built and tested a 1/8th scale model of a CSA. We observed a clean impulse response with FWHM of less than 70 ps. the maximum gain for both polarizations is between 0 and 10 dBi from 4 to 12 GHz. The return loss, however, is higher than we would like over most of the frequency range. Finally, we discuss a number of alternative concepts for mounting antennas onto UAVs with inflatable wings.
DTIC
Antenna Design; Conical Bodies; Radar Equipment; Slot Antennas; Tapering; Wings

20050192466 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Get a Charge, Get a Quantum Dot
Hogan, Hank; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 100; In English; Copyright; Avail: Other Sources

Researchers at Harvard University in Cambridge, Mass., R have demonstrated carbon nanotube-based quantum dots that

can be defined and controlled electrostatically and could be used for quantum computing systems. Previous nanotube-quantum dot studies investigated quantum dots formed by nanotube defects or by tunnel barriers in a metal/nanotube interface. With these methods, it was not possible to independently control device parameters, and there also were strict constraints on device design. The new technique gets around these restrictions because the quantum dots are defined by controlling gates.
Derived from text
Carbon Nanotubes; Quantum Computation; Nanotubes; Defects

20050194613 Technische Univ., Eindhoven, Netherlands, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Potential Oscillations and S-Shaped Polarization Curve in the Continuous Electro-Oxidation of CO on Platinum Single-Crystal Electrodes
Koper, M. T. M.; Schmidt, T. J.; Markovic, N. M.; Ross, P. N.; January 2005; 20 pp.; In English
Report No.(s): DE2005-836369; No Copyright; Avail: Department of Energy Information Bridge

The occurrence of an S-shaped polarization curve in a simple model for the continuous electrochemical oxidation of CO on a platinum electrode is discussed. In the model, the S-shaped polarization curve is caused by the competitive Langmuir-Hinshelwood mechanism between surface-bonded CO and OH. The reaction is studied experimentally on single-crystal platinum rotating disk electrodes in perchloric and sulfuric acid solution, and it is shown that the voltammetry is in good agreement with the model predictions. When studied under current-controlled conditions, a fast galvanodynamic scan indeed suggests the existence of the S-shaped polarization curve. At lower scan rates, however, irregularities and small-amplitude irregular fluctuations or oscillations in potential are observed. Very regular potential oscillations under current-controlled conditions are observed only on Pt(111) in sulfuric acid. The possible origin of these irregularities and oscillations is discussed in relation to the existing theories of electrochemical instabilities
NTIS
Electrochemical Oxidation; Electrodes; Oscillations; Oxidation; Oxides; Platinum; Single Crystals; Carbon Monoxide

20050195880 NASA Glenn Research Center, Cleveland, OH, USA
MEMS Device Being Developed for Active Cooling and Temperature Control
Moran, Matthew E.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

High-capacity cooling options remain limited for many small-scale applications such as microelectronic components, miniature sensors, and microsystems. A microelectromechanical system (MEMS) is currently under development at the NASA Glenn Research Center to meet this need. It uses a thermodynamic cycle to provide cooling or heating directly to a thermally loaded surface. The device can be used strictly in the cooling mode, or it can be switched between cooling and heating modes in milliseconds for precise temperature control. Fabrication and assembly are accomplished by wet etching and wafer bonding techniques routinely used in the semiconductor processing industry. Benefits of the MEMS cooler include scalability to fractions of a millimeter, modularity for increased capacity and staging to low temperatures, simple interfaces and limited failure modes, and minimal induced vibration.
Derived from text
Microelectromechanical Systems; Cooling; Temperature Control; Thermodynamic Cycles

20050195893 State Univ. of New York, Stony Brook, NY USA
Scaling Prospects for Ultimate Nanotransistors
Likharev, Konstantin K.; May 2005; 12 pp.; In English
Contract(s)/Grant(s): N00014-04-1-0542
Report No.(s): AD-A434579; 32804; 1040559; No Copyright; Avail: CASI; A03, Hardcopy

Advanced semiconductor field-effect transistors (FET), scaled into the sub-10-nm gate length range, are sometimes considered the main candidates for future nanoelectronics, even beyond the long-term horizon of the International Technology Roadmap for Semiconductors. In this project, the long-term prospects of FET scaling were evaluated in greater detail than ever before. In particular, the authors have calculated the source-drain I-V curves, subthreshold characteristics, voltage gain, and power consumption of sub-10-nm, double-gate silicon MOSFETs using the self-consistent solution of quasi-2D Schroedinger and 2D Poisson equations. Most importantly, the sensitivity of the transistor's characteristics (in particular, the gate voltage threshold) to variations in structure dimensions were evaluated in detail. The results show that this sensitivity, which strongly affects the fabrication facilities costs, sets the ultimate limits for CMOS technology scaling. Based on the results, this limit

is close to 10-nm gate length for single-gate transistors and 8-nm gate length for double-gate transistors. Further continuation of the Moore Law development of microelectronics will probably require a transfer to integrated circuits based on CMOS/nanodevice hybrids.
DTIC
Field Effect Transistors; Microelectronics; Nanotechnology; Semiconductors (Materials); Transistors

20050195897 OrganicID, Inc., Colorado Springs, CO USA
Organic Based Flexible Transistors and Electronic Device
Lee, Charles Y.; Dimmler, Klaus; May 2005; 36 pp.; In English
Contract(s)/Grant(s): FA9550-04-C-0080
Report No.(s): AD-A434601; AFRL-SR-AR-TR-05-0232; No Copyright; Avail: CASI; A03, Hardcopy

The Phase 1 materials development effort was highly productive with the proposed Phase I milestones accomplished or exceeded. The results of Phase I have successfully demonstrated that an air-stable, high mobility n-type organic material can be synthesized and integrated into a process to form an organic CMOS process. Phase I has further demonstrated effective solutions to the challenges that are generally associated with such integration. including the development of an appropriate dielectric and electrode which are compatible with p-type materials as well.
DTIC
Semiconductors (Materials); Transistors

20050196037 Massachusetts Inst. of Tech., Cambridge, MA USA
Fabrication Process Changes for Performance Improvement of a RF MEMS resonator: Conformable Contact Lithography, Moire Alignment, and Chlorine Dry Etching
Sakai, Mark; Jun. 2005; 106 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434850; AFIT-CI04-1104; No Copyright; Avail: CASI; A06, Hardcopy

This thesis presents fabrication process improvements for a RP MEMS resonator for the purpose of improving the quality factor (Q) and extending the frequency range. The process changes include the use of conformable contact lithography (CCL) and chlorine-based dry etching for improved fine-feature patterning and moire-based alignment techniques to allow for a non-self-aligned process. The resulting control over feature size and structure are expected to improve Q and enable higher frequency resonators. A CCL process utilizing moire alignment marks is described. An automated moire-based alignment system using Labview software is presented which demonstrates sub-100 nm alignment accuracy for a single alignment mark. A full-water alignment experiment is described that demonstrates average pattern placement errors of \ 0.187 micrometers \ and \ 0. 296 micrometers \ for the x and y directions respectively. The experimental limitations are analyzed and suggested improvements to the system are detailed.
DTIC
Alignment; Chlorine; Drying; Etching; Fabrication; Lithography; Microelectromechanical Systems; Radio Frequencies; Resonators

20050196110 Science Applications International Corp., Burlington, MA USA
Computer-Aided Design and Optimization of High-Performance Vacuum Electronic Devices
DeFord, John F.; Held, Ben; Chernyakova, Liya; Petillo, John; May 2005; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-04-M-0169
Report No.(s): AD-A434968; No Copyright; Avail: Defense Technical Information Center (DTIC)

During the Phase 1 Option we have focused on developing a suitable model for a more realistic optimization of the collector that was analyzed at the end of the Phase 1 project (Fig. 1). Of particular interest are the minimum mesh density and the characteristics of the secondary populations that yield converged, or nearly converged, solutions in MICHELLE. The result of our investigation was the determination that a modest-sized mesh (^550K elements), together with three generations of secondaries and 10 relaxation cycles, yields reasonably converged results. These parameters were used for an optimization of the collector. This optimization resulted in a structure that showed an increase of over 24% in efficiency as compared to the initial design. However, the optimized parameter values showed some unusual characteristics that may reflect a local, not global, minimum. This will need further study during the Phase 2 project.
DTIC
Computer Aided Design; Design Optimization; Electronic Equipment; Vacuum; Vacuum Apparatus

20050196125 Texas Univ., Austin, TX USA

Quarterly Progress Report - Homopolar Motors Contract N00014-05-1-0123 for Period of Performance, March 1, 2005 - May 31, 2005

Mcnab, Ian R.; Jun. 2005; 16 pp.; In English

Contract(s)/Grant(s): N00014-05-1-0123

Report No.(s): AD-A434994; IAT.R-0418; No Copyright; Avail: CASI; A03, Hardcopy

This quarterly report provides a summary of support provided by the Institute for Advanced Technology (lAT) at The University of Texas at Austin (UT) to the Office of Naval Research (ONR) on the development of high-power superconducting homopolar motors for ship propulsion. One of the major issues facing the development of such machines for ship propulsion is the lifetime of the brushes used to transfer power from the homopolar motor rotor to the stator. Significant loss and wear polarity differences have been observed during the testing of such brushes, and ONR is developing a fundamental science program to address these issues. During this quarter, lAT personnel participated in an integrated product team (IPT) meeting, giving impromptu presentations on historical aspects of fiber brush development and providing written comments to the ONR program manager afterward. In addition, lAT personnel reviewed weekly data reports provided by General Atomics (GA).

DTIC

Brushes; Carbon Fibers; Eccentricity; Marine Propulsion; Stators; Superconductors (Materials)

20050196126 Michigan Univ., Ann Arbor, MI USA

A Broadband VHF-L Band Cavity-Backed Slot Spiral Antenna

Volakis, John L.; May 2005; 58 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-98-C-0233; Proj-2317

Report No.(s): AD-A434995; AFRL-IF-RS-TR-2005-169; No Copyright; Avail: Defense Technical Information Center (DTIC)

Slot spiral antennas offer the possibility for very thin and conformal designs. This report covers the physical characteristic of a cavity-backed slot spiral, as well as the associated infinite balun and termination designs. The report traces through the development and characteristics of a 6 inch and 18 inch version of the slot spiral. Simulations and measurements of various cavity-backed spirals are presented and used to optimize the antenna's computations. Several options for miniaturizing this design using capacitive and inductive loadings are also presented.

DTIC

Broadband; Cavities; Slot Antennas; Spiral Antennas; Ultrahigh Frequencies; Very High Frequencies

20050196165 Lehigh Univ., Bethlehem, PA USA

A Model for Dielectric-Charging Effects in RF MEMS Capacitive Switches

Yuan, Xiaobin; Hwang, James C.; Forehand, David; Goldsmith, Charles L.; Mar. 2005; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-03-C-7003; Proj-ARPS

Report No.(s): AD-A435056; AFRL-SN-WP-TP-2005-104; No Copyright; Avail: Defense Technical Information Center (DTIC)

For the first time, charging and discharging of traps in the dielectric of state-of-the-art RF MEMS capacitive switches were characterized in detail. Densities and time constants of different trap species were extracted under different control voltages. It was found that, while charging and discharging time constants are relatively independent of control voltage, steady-state charge densities increase exponentially with control voltage. A charge model was constructed to predict the amount of charge injected into the dielectric and the corresponding shift in actuation voltage. The model was verified against the actuation-voltage shift under accelerated test conditions and found to be in good agreement with the experimental data. Both modeled and measured data suggested that the dielectric-charging effects can be accelerated by duty cycle and peak voltage of the actuation waveform.

DTIC

Capacitance; Dielectric Properties; Dielectrics; Electric Charge; Electric Switches; Microelectromechanical Systems; Radio Frequencies; Switches

20050196183 California Univ., Davis, CA USA

Synthesis of Bulk Nanostructured Al Alloys with Ultra-High Strength and Wear Resistance for Army Applications

Lavernia, E. J.; Apr. 2005; 24 pp.; In English

Contract(s)/Grant(s): DAAD-19-03-1-0020

Report No.(s): AD-A435084; ARO-44431.9-MS; No Copyright; Avail: CASI; A03, Hardcopy

Synthesis/processing of nanostructured (amorphous or ultra fine grained) materials was studied via various processing routes such as gas atomization, melt spinning, cryomilling, equal-channel angular pressing (ECAP) and conventional consolidation. Microstructures and mechanical properties of both the amorphous powders and consolidated bulk materials were characterized. The amorphous alloy of A185Ni10La5 (at.%) was fabricated in terms of melt-spun ribbons and particularly, gas-atomized powders (\h25 micrometers). The kinetics and microstructure evolution during the devitrification process were carefully investigated using DSC, XRD. SEM, TEM, and SAxS. It was found that quenched-in fcc-Al nuclei present in amorphous Al85Ni10La5 powders. Annealing at 235 degrees C leads to growth of the quenched-in nuclei with the grain size stabilized around 10 nm. With increasing annealing temperatures (i.e., at 245 degs C, 250 degs C and 263 degs), the devitrification takes place via eutectic crystallization with a resultant grain size around 20 nm. At the temperatures \g283 degs, the devitrification tends to complete in a short time (-5 min), however, this alloy shows excellent thermal stability to resist grain growth. The influence of devitrification, under various annealing temperatures, on mechanical response was studied by nanoindentation technique. Bulk nanostructured materials were synthesized by consolidating the amorphous Al85Ni10La5 alloy powder with 5083 Al alloy powder milled under cryogenic temperature (cryomilling). The addition of cryomilled 5083 Al alloy is to further increase the specific strength for the bulk materials (e.g., \g1000 MPa in compression with the density -2.9 g/cc). The bulk nanostructured material also shows high strength at elevated temperatures (i.e., 400 MPa in compression at 200deg). At room temperature the tensile properties were found be lower than the compressive properties and this differential effects should be investigated in the future st7

DTIC

Aluminum Alloys; Microstructure; Wear Resistance

20050196225 Opteos, Inc., Ann Arbor, MI USA

Embedded Electro-Optic Sensor Network for the On-Site Calibration and Real-Time Performance Monitoring of Large-Scale Phased Arrays

Yang, Kyoung; Jul. 2005; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): HQ0006-05-C-7155

Report No.(s): AD-A435142; No Copyright; Avail: Defense Technical Information Center (DTIC)

This progress report summarizes the outline and synopsis of Opteos' Phase I SBIR project entitled 'Embedded Electro-Optic Sensor Network for the On-Site Calibration and Real-Time Performance Monitoring of Large-Scale Phased Arrays'. The main objective of the project is to develop an innovative electric-field sensor network based on an electro-optic field-detection technique (the Electro-optic Sensor Network, or ESN) for the performance evaluation of phased antenna arrays at the end of their development/production cycle, and furthermore, for onsite test and calibration of deployed large-scale phased arrays. During this reporting period, Opteos, Inc. invited Robert C. Parks, a COR for this SBIR project, to discuss and finalize the overall R&D direction for the Phase I SBIR project. As a result of productive discussions, we have agreed that Opteos would focus its effort on several key objectives during this Phase I, including enhancement of the stability of the EO sensor, acquisition of a fiber-optic-based switch, development of optical-switch control electronics, and a small scale feasibility demonstration at the end of Phase I. This plan maximizes flexibility so that Opteos would be able to pursue either an external, multi-element scanning array of EO sensors or an embedded network of sensors. In addition to the kickoff meeting, Opteos has surveyed the available product space for an adequate, commercially produced optical switch for this SBIR project. As a result of our effort, Opteos was able to identify an optical switch that can support four EO sensors in a sequential manner.

DTIC

Antenna Arrays; Calibrating; Electro-Optics; Embedding; Optical Measuring Instruments; Phased Arrays; Real Time Operation

20050196261 Systran Federal Corp., Dayton, OH USA

Pipelined Delta Sigma Modulator Analog to Digital Converter for SOC applications

Ren, Saiyu; Siferd, Ray; Blumgold, Robert; Apr. 2005; 7 pp.; In English

Contract(s)/Grant(s): F33615-03-C-1439; Proj-3005

Report No.(s): AD-A435208; AFRL-SN-WP-TP-2005-105; No Copyright; Avail: Defense Technical Information Center (DTIC)

A two-stage Pipelined Delta Sigma Modulator analog-to-digital converter is presented for broad band, high resolution System-on-a-Chip (SOC) applications. Input bandwidth is 62.5 MHz and the sampling frequency of 1 GHz results in an oversampling ratio of 8, and a 12-bit resolution with a 50 MHz input.

DTIC

Analog to Digital Converters; Chips; Delta Modulation; Modulators; Pipelines

20050196603 NASA Glenn Research Center, Cleveland, OH, USA

Chemical State of Surface Oxygen on Carbon and Its Effects on the Capacity of the Carbon Anode in a Lithium-Ion Battery Investigated

Hung, Ching-Cheh; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

In a lithium-ion battery, the lithium-storage capacity of the carbon anode is greatly affected by a surface layer formed during the first half cycle of lithium insertion and release into and out of the carbon anode. The formation of this solid-electrolyte interface, in turn, is affected by the chemistry of the carbon surface. A study at the NASA Glenn Research Center examined the cause-and-effect relations. Information obtained from this research could contribute in designing a high-capacity lithium-ion battery and, therefore, small, powerful spacecraft. In one test, three types of surfaces were examined: (1) a surface with low oxygen content (1.5 at.%) and a high concentration of active sites, (2) a surface with 4.5 at.% -OH or -OC type oxygen, and (3) a surface with 6.5 at.% O=C type oxygen. The samples were made from the same precursor and had similar bulk properties. They were tested under a constant current of 10 mA/g in half cells that used lithium metal as the counter electrode and 0.5 M lithium iodide in 50/50 (vol%) ethylene carbonate and dimethyl carbonate as the electrolyte. For the first cycle of the electrochemical test, the graph describes the voltage of the carbon anode versus the lithium metal as a function of the capacity (amount of lithium insertion or release). From these data, it can be observed that the surface with low oxygen and a high concentration of active sites could result in a high irreversible capacity. Such a high irreversible capacity could be prevented if the active sites were allowed to react with oxygen in air, producing -OH or -OC type oxygen. The O=C type oxygen, on the other hand, could greatly reduce the capacity of lithium intercalation and, therefore, needs to be avoided during battery fabrication.

Author

Anodes; Carbon; Fabrication; Metal Ions; Lithium Batteries

20050196605 NASA Glenn Research Center, Cleveland, OH, USA

Electronics for Low-Temperature Space Operation Being Evaluated

Patterson, Richard L.; Hammoud, Ahmad; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Electronic components and systems capable of low-temperature operation are needed for many future NASA missions where it is desirable to have smaller, lighter, and cheaper (unheated) spacecraft. These missions include Mars (-20 to -120 C) orbiters, landers, and rovers; Europa (-150 C) oceanic exploratory probes and instrumentation; Saturn (-183 C) and Pluto (-229 C) interplanetary probes. At the present, most electronic equipment can operate down to only -55 C. It would be very desirable to have electronic components that expand the operating temperature range down to -233 C. The successful development of these low-temperature components will eventually allow space probes and onboard electronics to operate in very cold environments (out as far as the planet Pluto). As a result, radioisotope heating units, which are used presently to keep space electronics near room temperature, will be reduced in number or eliminated. The new cold electronics will make spacecraft design and operation simpler, more flexible, more reliable, lighter, and cheaper. Researchers at the NASA Glenn Research Center are evaluating potential commercial off-the- shelf devices and are developing new electronic components that will tolerate operation at low temperatures down to -233 C. This work is being carried out mainly inhouse and also through university grants and commercial contracts. The components include analog-to-digital converters, semiconductor switches, capacitors, dielectric and packaging material, and batteries. For example, the effect of low temperature on the capacitance of three different types of capacitors is shown in the graph. Using these advanced components, system products will be developed, including dc/dc converters, battery charge/discharge management systems, digital control electronics, transducers, and sensor instrumentation.

Derived from text

Electronic Equipment; Space Temperature; Temperature Effects; Semiconductors (Materials)

20050196609 NASA Glenn Research Center, Cleveland, OH, USA

Thermally Stable Ohmic Contacts on Silicon Carbide Developed for High- Temperature Sensors and Electronics

Okojie, Robert S.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The NASA aerospace program, in particular, requires breakthrough instrumentation inside the combustion chambers of engines for the purpose of, among other things, improving computational fluid dynamics code validation and active engine behavioral control (combustion, flow, stall, and noise). This environment can be as high as 600 degrees Celsius, which is beyond the capability of silicon and gallium arsenide devices. Silicon-carbide- (SiC-) based devices appear to be the most

technologically mature among wide-bandgap semiconductors with the proven capability to function at temperatures above 500 degrees Celsius. However, the contact metalization of SiC degrades severely beyond this temperature because of factors such as the interdiffusion between layers, oxidation of the contact, and compositional and microstructural changes at the metal/semiconductor interface. These mechanisms have been proven to be device killers. Very costly and weight-adding packaging schemes that include vacuum sealing are sometimes adopted as a solution.
Derived from text
Silicon Carbides; Temperature Sensors; Thermal Stability; Ohms Law

20050196610 NASA Glenn Research Center, Cleveland, OH, USA
Atomically Flat Surfaces Developed for Improved Semiconductor Devices
Powell, J. Anthony; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

New wide bandgap semiconductor materials are being developed to meet the diverse high temperature, -power, and -frequency demands of the aerospace industry. Two of the most promising emerging materials are silicon carbide (SiC) for high-temperature and high power applications and gallium nitride (GaN) for high-frequency and optical (blue-light-emitting diodes and lasers) applications. This past year Glenn scientists implemented a NASA-patented crystal growth process for producing arrays of device-size mesas whose tops are atomically flat (i.e., step-free). It is expected that these mesas can be used for fabricating SiC and GaN devices with major improvements in performance and lifetime. The promising new SiC and GaN devices are fabricated in thin-crystal films (known as epi films) that are grown on commercial single-crystal SiC wafers. At this time, no commercial GaN wafers exist. Crystal defects, known as screw defects and micropipes, that are present in the commercial SiC wafers propagate into the epi films and degrade the performance and lifetime of subsequently fabricated devices. The new technology isolates the screw defects in a small percentage of small device-size mesas on the surface of commercial SiC wafers. This enables atomically flat surfaces to be grown on the remaining defect-free mesas. We believe that the atomically flat mesas can also be used to grow GaN epi films with a much lower defect density than in the GaN epi films currently being grown. Much improved devices are expected from these improved low-defect epi films. Surface-sensitive SiC devices such as Schottky diodes and field effect transistors should benefit from atomically flat substrates. Also, we believe that the atomically flat SiC surface will be an ideal surface on which to fabricate nanoscale sensors and devices. The process for achieving atomically flat surfaces is illustrated. The surface steps present on the 'as-received' commercial SiC wafer is also illustrated. because of the small tilt angle between the crystal 'basal' plane and the polished wafer surface. These steps are used in normal SiC epi film growth in a process known as stepflow growth to produce material for device fabrication. In the new process, the first step is to etch an array of mesas on the SiC wafer top surface. Then, epi film growth is carried out in the step flow fashion until all steps have grown themselves out of existence on each defect-free mesa. If the size of the mesas is sufficiently small (about 0.1 by 0.1 mm), then only a small percentage of the mesas will contain an undesired screw defect. Mesas with screw defects supply steps during the growth process, allowing a rough surface with unwanted hillocks to form on the mesa. The improvement in SiC epi surface morphology achievable with the new technology is shown. An atomic force microscope image of a typical SiC commercial epilayer surface is also shown. A similar image of an SiC atomically flat epi surface grown in a Glenn laboratory is given. With the current screw defect density of commercial wafers (about 5000 defects/cm2), the yield of atomically free 0.1 by 0.l mm mesas is expected to be about 90 percent. This is large enough for many types of electronic and optical devices. The implementation of this new technology was recently published in Applied Physics Letters. This work was initially carried out in-house under a Director's Discretionary Fund project and is currently being further developed under the Information Technology Base Program.
Author (revised)
Flat Surfaces; Semiconductor Devices; Atomic Force Microscopy; Fabrication

20050196615 Analex Corp., OH, USA
Accurate Time-Dependent Traveling-Wave Tube Model Developed for Computational Bit-Error-Rate Testing
Kory, Carol L.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The phenomenal growth of the satellite communications industry has created a large demand for traveling-wave tubes (TWT's) operating with unprecedented specifications requiring the design and production of many novel devices in record time. To achieve this, the TWT industry heavily relies on computational modeling. However, the TWT industry's computational modeling capabilities need to be improved because there are often discrepancies between measured TWT data and that predicted by conventional two-dimensional helical TWT interaction codes. This limits the analysis and design of novel devices or TWT's with parameters differing from what is conventionally manufactured. In addition, the inaccuracy of current computational tools limits achievable TWT performance because optimized designs require highly accurate models.

To address these concerns, a fully three-dimensional, time-dependent, helical TWT interaction model was developed using the electromagnetic particle-in-cell code MAFIA (Solution of MAxwell's equations by the Finite-Integration-Algorithm). The model includes a short section of helical slow-wave circuit with excitation fed by radiofrequency input/output couplers, and an electron beam contained by periodic permanent magnet focusing. A cutaway view of several turns of the three-dimensional helical slow-wave circuit with input/output couplers is shown. This has been shown to be more accurate than conventionally used two-dimensional models. The growth of the communications industry has also imposed a demand for increased data rates for the transmission of large volumes of data. To achieve increased data rates, complex modulation and multiple access techniques are employed requiring minimum distortion of the signal as it is passed through the TWT. Thus, intersymbol interference (ISI) becomes a major consideration, as well as suspected causes such as reflections within the TWT. To experimentally investigate effects of the physical TWT on ISI would be prohibitively expensive, as it would require manufacturing numerous amplifiers, in addition to acquiring the required digital hardware. As an alternative, the time-domain TWT interaction model developed here provides the capability to establish a computational test bench where ISI or bit error rate can be simulated as a function of TWT operating parameters and component geometries. Intermodulation products, harmonic generation, and backward waves can also be monitored with the model for similar correlations. The advancements in computational capabilities and corresponding potential improvements in TWT performance may prove to be the enabling technologies for realizing unprecedented data rates for near real time transmission of the increasingly larger volumes of data demanded by planned commercial and Government satellite communications applications. This work is in support of the Cross Enterprise Technology Development Program in Headquarters' Advanced Technology & Mission Studies Division and the Air Force Office of Scientific Research Small Business Technology Transfer programs.
Author
Bit Error Rate; Time Dependence; Traveling Wave Tubes; Two Dimensional Models

20050196670 NASA Glenn Research Center, Cleveland, OH, USA
New Aptes Cross-linked Polymers from Poly(ethylene oxide)s and Cyanuric Chloride for Lithium Batteries
Tigelaar, Dean M.; Meador, Mary Ann B.; Kinder, James D.; Bennett, William R.; [2005]; 26 pp.; In English
Contract(s)/Grant(s): NCC3-1089; 22-066-20-05
Report No.(s): E-15192; Copyright; Avail: CASI; A03, Hardcopy

A new series of polymer electrolytes for use as membranes for lithium batteries are described. Electrolytes were made by polymerization between cyanuric chloride and diamino-terminated poly(ethylene oxide)s, followed by cross-linking via a sol-gel process. Thermal analysis and lithium conductivity of freestanding polymer films were studied. The effects of several variables on conductivity were investigated, such as length of backbone PEO chain, length of branching PEO chain, extent of branching, extent of cross-linking, salt content, and salt counterion. Polymer films with the highest percentage of PEO were found to be the most conductive, with a maximum lithium conductivity of 3.9 x 10(exp -5) S/cm at 25 C. Addition of plasticizer to the dry polymers increased conductivity by an order of magnitude.
Author
Lithium Batteries; Crosslinking; Polymerization; Sol-Gel Processes; Thermal Analysis; Membranes

20050196745 Brookhaven National Lab., Upton, NY, USA
Adjusted Field Profile for the Chromaticity Cancellation in FFAG Accelerators
Ruggiero, A. G.; January 2005; 8 pp.; In English
Report No.(s): DE2005-15011151; BNL-73586-2005; No Copyright; Avail: Department of Energy Information Bridge

In an earlier report they have reviewed four major rules to design the lattice of Fixed-Field Alternating-Gradient (FFAG) accelerators. One of these rules deals with the search of the Adjusted Field Profile, that is the field non-linear distribution along the length and the width of the accelerator magnets, to compensate for the chromatic behavior, and thus to reduce considerably the variation of betatron tunes during acceleration over a large momentum range. The present report defines the method for the search of the Adjusted Field Profile.
NTIS
Particle Accelerators; Nucleonics; Electric Fields; Magnetic Fields

20050196797 Lawrence Livermore National Lab., Livermore, CA USA
Pulse Requirements for Electron Diffraction Imaging of Single Biological Molecules
Oct. 28, 2004; 20 pp.; In English
Report No.(s): DE2005-15014820; UCRL-TR-207533; No Copyright; Avail: Department of Energy Information Bridge

The pulse requirements for electron diffraction imaging of single biological molecules are calculated. We find that the electron fluence and pulse length requirements imposed by the damage limit and by the need to classify the diffraction patterns according to their angular orientation cannot be achieved with todays electron beam technology. A simple analytical model shows that the pulse requirements cannot be achieved due to beam broadening due to spacecharge effects.
NTIS
Crystallography; Electron Diffraction; Imaging Techniques; Molecules; Pulse Diffraction

20050198966 NASA Glenn Research Center, Cleveland, OH, USA
Carrier Modulation Via Waveform Probability Density Function
Williams, Glenn L.; [2004]; 4 pp.; In English
Contract(s)/Grant(s): WBS 22-400-32-30-07
Report No.(s): IEEE-04-0755; E-14908; No Copyright; Avail: CASI; A01, Hardcopy

Beyond the classic modes of carrier modulation by varying amplitude (AM), phase (PM), or frequency (FM), we extend the modulation domain of an analog carrier signal to include a class of general modulations which are distinguished by their probability density function histogram. Separate waveform states are easily created by varying the PDF of the transmitted waveform. Individual waveform states are assignable as proxies for digital ONEs or ZEROs. At the receiver, these states are easily detected by accumulating sampled waveform statistics and performing periodic pattern matching, correlation, or statistical filtering. No fundamental natural laws are broken in the detection process. We show how a typical modulation scheme would work in the digital domain and suggest how to build an analog version. We propose that clever variations of the modulating waveform (and thus the histogram) can provide simple steganographic encoding.
Author
Modulation; Waveforms; Probability Density Functions; Mathematical Models

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FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20050188634 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Analysis of Computational Methods for the Treatment of Material Interfaces
Nguyen, Minh C.; Mar. 2005; 105 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434270; AFIT/GAE/ENY/05-M15; No Copyright; Avail: CASI; A06, Hardcopy

Rocket sled tests at the Air Force Research Laboratory's Holloman High Speed Test Track frequently approach velocities where gouging development becomes the limiting factor to achieving higher operating velocities. Direct observation of the gouging process is not possible so computational modeling is necessary to study the phenomenon. Since gouging development is dependent on the impact surface conditions, the method used to model material interfaces directly affects the accuracy of the solution. Three methods are available in the hydrocode CTH to handle material interfaces: 1) materials are joined at the interface, 2) a frictionless slide line is inserted, and 3) a boundary layer interface is established. An axisymmetric impact scenario is used to explore these methods and their influence on high energy impact solutions. The three methods are also compared in an axisymmetric sliding scenario. The method of joining materials at the contact surface appears well suited to the simulation of high energy impact events. The frictionless slide line method produces significant numerical instability, while the boundary layer interface method is too limited for two dimensional applications.
DTIC
Hypervelocity Impact; Sleds

20050188672 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Fuel-Air Injection Effects on Combustion in Cavity-Based Flameholders in a Supersonic Flow
Allen, William H., Jr; Mar. 2005; 104 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434322; AFIT/GAE/ENY/05-M02; No Copyright; Avail: CASI; A06, Hardcopy

The Air Force Research Lab, Propulsion Directorate, Wright-Patterson Air Force Base, Ohio has studied several designs regarding cavity flameholding for supersonic RAMJET (SCRAMJET) applications. The most recent of these studies have concluded that direct injection of ethylene fuel into the aft cavity ramp produced an efficient, robust flameholder given specific freestream condition and fuel flow rate. The main goals of this experiment are: 1) study the effect on combustion of direct fuel

and air injection in the main flameholding cavity and 2) characterization of the operational limits (i.e., sustained combustion limits) over a variety of fuel and air flow rates. Direct injection of both fuel and air provided additional capability to tune the cavity such that a more stable decentralized flame results. The addition of air injection provided the most improvement over the baseline case (fuel only) near the upstream portion of the cavity close to the cavity step. Direct air injection provided a second source of oxygen to be consumed during the combustion process thereby expanding the operational limits drastically for each selected fuel flow. This experimental investigation was limited by the size of the flow controllers available and by the maximum allowable material temperature given cavity flow parameters. Lean blowout was not observed to be a function of injected air flow.
DTIC
Air Flow; Cavities; Combustion; Flame Holders; Fuel Injection; Injection; Supersonic Flow

20050188705 Phillips Lab., Hanscom AFB, MA USA
Short Introduction to Quantum Computation
Yepez, Jeffrey; Jul. 1996; 6 pp.; In English
Report No.(s): AD-A434366; No Copyright; Avail: Defense Technical Information Center (DTIC)
This paper presents a quantum lattice gas method useful for nano-scale computing and quantum computing. There are several important issues that arise when one considers fabricating nano-scale computing devices, and these issues are different depending on the type of computing one expects to do at this scale. The first type of computing, introduced by Ed Fredkin, Tom Toffoli, and Norm Margolus would be classical computing where Boolean bits that have a definite value of either 0 or 1 are still employed and where all logical gate operations are represented by unitary permutation operators causing neither any quantum mechanical superposition nor any quantum entanglement. This kind of computing may best be termed nano-scale computing. A second type of computing, introduced by Richard Feynman has been termed quantum computing where two-level quantum objects, such as spin-1/2 particles, are used to represent quantum bits or 'qubits' and where quantum superposition and entanglement are integral to the logical gate operations and are required for computational efficiency. The characteristic nature of a qubit is that it can be in a superposition of the Boolean states 0 and 1, prototypically the ground state and excited state of a two-level quantum system. In nano-scale computing, one tries to implement reversible classical algorithms whose logical gate operations are represented by orthogonal permutation matrices, which are a special class of unitary matrices. The author discusses various reasons why one is driven to develop reversible algorithms for nano-scale computing. He then discusses how quantum computing relies on quantum interference and entanglement over a system of qubits occurring in a controlled fashion. These qubits will likely be spin-1/2 objects. To date, only one important algorithm is known whose efficiency is based on quantum interference and entanglement: Shors' prime number factoring algorithm.
DTIC
Gas Dynamics; Nanotechnology; Quantum Computation; Quantum Theory

20050188731 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Boundary Layer Flow Control Using Plasma Induced Velocity
Balcer, Brian E.; Mar. 2005; 113 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434432; AFIT/GAE/ENY/05-M03; No Copyright; Avail: Defense Technical Information Center (DTIC)
An examination of the effects of plasma induced velocity on boundary layer flow was conducted. A pair of thin copper film electrodes spanned the test section, oriented at thirty degrees from normal to the free stream flow. An adverse pressure gradient was imposed over the electrode configuration using a pressure coefficient profile similar to that associated with suction side of a Pac-B low pressure turbine blade. In addition, suction was applied to keep flow attached on the upper wall, inducing separation over the electrode. The electrode is supplied by an AC source at three different power levels with the free stream flow at three separate chord Reynolds numbers. The chord length was based on the geometry of the simulated airfoil profile used for the upper wall of the test section. The flow turbulence intensity was varied by means of a passive grid in the upstream flow. Velocity data were collected using particle imaging velocimetry as well as with a boundary layer pitot probe. The power levels applied to the plasma were between 20 and 40 watts. The flow regimes studied were between chord Reynolds numbers of 50,000 to 100,000. It was found that the use of plasma to control the boundary layer enabled the flow to remain attached in the presence of an adverse pressure gradient. However, at the studied Reynolds numbers and electrode configuration the plasma was unable to affect an already separated flow regardless of the power input to the electrode. It was finally ascertained that two types of turbulent structures could be resolved, one being a counter-rotating vorticity pair and the other being a counter-rotating vorticity sheet.
DTIC
Boundary Layer Flow; Particle Image Velocimetry; Plasmas (Physics)

20050192470 NASA Langley Research Center, Hampton, VA, USA

A Computational Study of a New Dual Throat Fluidic Thrust Vectoring Nozzle Concept

Deere, Karen A.; Berrier, Bobby L.; Flamm, Jeffrey D.; Johnson, Stuart K.; [2005]; 16 pp.; In English; 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 10-13 Jul. 2005, Tucson, AZ, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): 23-066-50-AE

Report No.(s): AIAA Paper 2005-3502; No Copyright; Avail: CASI; A03, Hardcopy

A computational investigation of a two-dimensional nozzle was completed to assess the use of fluidic injection to manipulate flow separation and cause thrust vectoring of the primary jet thrust. The nozzle was designed with a recessed cavity to enhance the throat shifting method of fluidic thrust vectoring. Several design cycles with the structured-grid, computational fluid dynamics code PAB3D and with experiments in the NASA Langley Research Center Jet Exit Test Facility have been completed to guide the nozzle design and analyze performance. This paper presents computational results on potential design improvements for best experimental configuration tested to date. Nozzle design variables included cavity divergence angle, cavity convergence angle and upstream throat height. Pulsed fluidic injection was also investigated for its ability to decrease mass flow requirements. Internal nozzle performance (wind-off conditions) and thrust vector angles were computed for several configurations over a range of nozzle pressure ratios from 2 to 7, with the fluidic injection flow rate equal to 3 percent of the primary flow rate. Computational results indicate that increasing cavity divergence angle beyond 10 is detrimental to thrust vectoring efficiency, while increasing cavity convergence angle from 20 to 30 improves thrust vectoring efficiency at nozzle pressure ratios greater than 2, albeit at the expense of discharge coefficient. Pulsed injection was no more efficient than steady injection for the Dual Throat Nozzle concept.

Author

Boundary Layer Separation; Computational Fluid Dynamics; Nozzle Design; Dual Thrust Nozzles; Nozzle Geometry; Thrust Vector Control

20050192551 George Washington Univ., USA

Computational Modeling And Analysis Of Synthetic Jets

Mittal, Rajat; Cattafesta, Lou; [2005]; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG1-01024; No Copyright; Avail: CASI; A03, Hardcopy

In the last report we focused on the study of 3D synthetic jets of moderate jet aspect-ratio. Jets in quiescent and cross-flow cases were investigated. Since most of the synthetic jets in practical applications are found to be of large aspect ratio, the focus was shifted to studying synthetic jets of large aspect ratio. In the current year, further progress has been made by studying jets of aspect ratio 8 and infinity. Some other aspects of the jet, like the vorticity flux is looked into apart from analyzing the vortex dynamics, velocity profiles and the other dynamical characteristics of the jet which allows us to extract some insight into the effect of these modifications on the jet performance. Also, efforts were made to qualitatively validate the simulated results with the NASA Langley test cases at higher jet Reynolds number for the quiescent jet case.

Author

Three Dimensional Flow; Jet Flow; Mathematical Models

20050192585 Colorado Univ., Boulder, CO, USA

Surface Collisions Involving Particles and Moisture (SCIP'M)

Davis, Robert H.; July 18, 2005; 17 pp.; In English

Contract(s)/Grant(s): NCC3-796; No Copyright; Avail: CASI; A03, Hardcopy

Experiments were performed on the collision of a solid sphere with a nearly horizontal flat surface covered with a thin layer of viscous liquid. High-speed collisions were obtained by dropping the ball onto the surface from various heights, using gravitational acceleration. Low-speed collisions were obtained using pendulums with long strings or by launching the balls at low velocities in the reduced-gravity environment of parabolic flight. The sphere bounces only when the impact velocity exceeds a critical value. The coefficient of restitution (ratio of rebound velocity to impact velocity) increases with increasing impact velocity above the critical value, indicating the increasing relative importance of elastic deformation to viscous dissipation. The critical impact velocity increases, and the coefficient of restitution decreases, with increasing viscosity or thickness of the liquid layer and with decreasing density or size of the sphere. The ratio of the wet and dry coefficients is expressed as a function of the Stokes number (ratio of particle inertia and viscous forces), showing good agreement between theory and experiment. Similar experiments were performed with the flat surface inclined at various angles to the approaching sphere. A modified Stokes number, which is a measure of the ratio of inertia of the sphere in the normal direction to the viscous forces exerted by the fluid layer, was used for the analysis of oblique collisions. Even for these oblique collisions, it was found

that no rebound of the ball was observed below a certain critical Stokes number. The coefficient of normal restitution, defined as a ratio of normal rebound velocity to normal approach velocity, was found to increase beyond the critical Stokes number and even out as it approaches the value for dry restitution at high Stokes numbers. It was also found that, for smooth spheres like steel, the normal restitution at the same modified Stokes number is independent of the angle of impact. The tangential coefficient of restitution, defined as the ratio of tangential rebound velocity to tangential approach velocity, is found to be nearly unity, except for very low approach velocities. Thus, as a first approximation, the theories that predict the coefficient of restitution for head-on wet collisions can be extended to predict the coefficient of normal restitution for oblique wet collisions. Additional experiments were performed with soft surfaces in which a porous cloth or sponge layer was placed over the hard, flat surface. In these experiments, the coefficient of restitution was found to decrease with increasing impact velocity, due to inelastic losses in the soft material. A model combining inelastic deformation and flow through porous media was developed to describe these findings.
Author
Flat Surfaces; Moisture; Particle Collisions; Microgravity

20050192621 NASA Glenn Research Center, Cleveland, OH, USA
Density Relaxation of Liquid-Vapor Critical Fluids Examined in Earth's Gravity
Wilkinson, R. Allen; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

This work shows quantitatively the pronounced differences between the density equilibration of very compressible dense fluids in Earth's gravity and those in microgravity. The work was performed onsite at the NASA Glenn Research Center at Lewis Field and is complete. Full details are given in references 1 and 2. Liquid-vapor critical fluids (e.g., water) at their critical temperature and pressure, are very compressible. They collapse under their own weight in Earth's gravity, allowing only a thin meniscus-like layer with the critical pressure to survive. This critical layer, however, greatly slows down the equilibration process of the entire sample. A complicating feature is the buoyancy-driven slow flows of layers of heavier and lighter fluid. This work highlights the incomplete understanding of the hydrodynamics involved in these fluids.
Derived from text
Compressible Fluids; Earth Gravitation; Hydrodynamics

20050192624 NASA Langley Research Center, Hampton, VA, USA
Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1
Jones, Gregory S., Editor; Joslin, Ronald D., Editor; June 2005; 565 pp.; In English; 2004 NASA/ONR Circulation Control Workshop, 16-17 Mar. 2004, Hampton, VA, USA; See also 20050192625 - 20050192639
Contract(s)/Grant(s): WU 23-762-55-ME
Report No.(s): NASA/CP-2005-213509/PT1; L-18395A/PT1; No Copyright; Avail: CASI; A24, Hardcopy

As technological advances influence the efficiency and effectiveness of aerodynamic and hydrodynamic applications, designs and operations, this workshop was intended to address the technologies, systems, challenges and successes specific to Coanda driven circulation control in aerodynamics and hydrodynamics. A major goal of this workshop was to determine the 2004 state-of-the-art in circulation control and understand the roadblocks to its application. The workshop addressed applications, CFD, and experiments related to circulation control, emphasizing fundamental physics, systems analysis, and applied research. The workshop consisted of 34 single session oral presentations and written papers that focused on Naval hydrodynamic vehicles (e.g. submarines), Fixed Wing Aviation, V/STOL platforms, propulsion systems (including wind turbine systems), ground vehicles (automotive and trucks) and miscellaneous applications (e.g., poultry exhaust systems and vacuum systems). Several advanced CFD codes were benchmarked using a two-dimensional NCCR circulation control airfoil. The CFD efforts highlighted inconsistencies in turbulence modeling, separation and performance predictions.
Author
Circulation Control Airfoils; Coanda Effect; Propulsion System Performance; V/STOL Aircraft; Computational Fluid Dynamics

20050192628 NASA Langley Research Center, Hampton, VA, USA
Aspects of Numerical Simulation of Circulation Control Airfoils
Swanson, R. C.; Rumsey, C. L.; Anders, S. G.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 227-273; In English; See also 20050192624; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The mass-averaged compressible Navier-Stokes equations are solved for circulation control airfoils. Numerical solutions are computed with a multigrid method that uses an implicit approximate factorization smoother. The effects of flow conditions (e.g., free-stream Mach number, angle of attack, momentum coefficient) and mesh on the prediction of circulation control airfoil flows are considered. In addition, the impact of turbulence modeling, including curvature effects and modifications to reduce eddy viscosity levels in the wall jet (i.e., Coanda flow), is discussed. Computed pressure distributions are compared with available experimental data.
Author
Circulation Control Airfoils; Navier-Stokes Equation; Turbulence Models; Coanda Effect

20050192630 Georgia Inst. of Tech., Atlanta, GA, USA
Computational Evaluation of the Steady and Pulsed Jet Effects on the Performance of a Circulation Control Wing Section
Liu, Yi; Sankar, Lakshmi N.; Englar, Robert J.; Ahuja, Krishan K.; Gaeta, R.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 295-321; In English; See also 20050192624; Original contains color illustrations
Contract(s)/Grant(s): NAG1-2146; No Copyright; Avail: CASI; A03, Hardcopy

Circulation Control technology is a very effective way of achieving high lift forces required by aircraft during take-off and landing. This technology can also directly control the flow field over the wing. Compared to a conventional high-lift system, a Circulation Control Wing (CCW) can generate comparable or higher lift forces during take-off/landing with fewer or no moving parts and much less complexity. In this work, an unsteady three-dimensional Navier-Stokes analysis procedure has been developed and applied to Circulation Control Wing configurations. The effects of 2-D steady jets and 2-D pulsed jets on the aerodynamic performance of CCW airfoils have been investigated. It is found that a steady jet can generate very high lift at zero angle of attack without stall, and that a small amount of blowing can eliminate vortex shedding at the trailing edge, a potential noise source. It is also found that a pulsed jet can achieve the same high lift as a steady jet at lower mass flow rates, especially at a high frequency, and that the Strouhal number has a more dominant effect on the pulsed jet performance than just the frequency or the free-stream velocity.
Author
Computation; Jet Flow; Circulation Control Airfoils; Aerodynamic Characteristics; Flow Velocity; Lift

20050192631 Arizona Univ., Tucson, AZ, USA
Investigation of Turbulent Coanda Wall Jets Using DNS and RANS
Fasel, H.; Gross, A.; Wernz, S.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 337-367; In English; See also 20050192624; Original contains color and black and white illustrations
Contract(s)/Grant(s): N00014-01-1-09; No Copyright; Avail: CASI; A03, Hardcopy

Wall jets over curved surfaces have great potential for technical applications. Coanda wall jets over convex surfaces can effectively provide aerodynamic side forces or change the circulation of an airfoil. An existing application is the NOTAR helicopter, prospective applications are the enhancement of low-speed maneuverability of underwater vehicles or high-lift wings for STOL aircraft. However, without profound understanding of the mechanisms that keep the wall jet attached to the surface for large downstream distances, any implementation of Coanda flow technology must rely on empiricism and hence requires excessive safety margins to account for unknowns. In this paper results from numerical investigations of two separate Coanda flow experiments are presented that may help to shed some light on the relevant physical mechanisms.
Derived from text
Direct Numerical Simulation; Airfoils; Coanda Effect; Turbulent Jets; Wall Jets

20050192633 Pennsylvania State Univ., University Park, PA, USA
RANS and Detached-Eddy Simulation of the NCCR Airfoil
Paterson, Eric G.; Baker, Warren J.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 167-195; In English; See also 20050192624; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0122; No Copyright; Avail: CASI; A03, Hardcopy

A circulation control foil is studied using incompressible Reynolds-averaged Navier-Stokes and detached-eddy simulation CFD method. Contrary to expectations, it is shown that Reynolds-averaged Navier-Stokes simulations of two large jet-momentum coefficient cases with a linear Reynolds-stress closure and a blended kappa - omega/kappa - epsilon turbulence model is able to successfully predict the pressure-distribution trends in comparison to benchmark data. This implies that higher

order curvature-corrected models may only be required to resolve localized details such as the maximum suction peak on the Coanda surface.
Author (revised)
Eddy Currents; Computational Fluid Dynamics; Circulation Control Airfoils; Reynolds Stress; Pressure Distribution; Navier-Stokes Equation; K-Epsilon Turbulence Model

20050192635 Arizona Univ., Tucson, AZ, USA
Some Circulation Control Experiments
Cerchie, D.; Cullen, L.; Goldstein, J.; Halfon, E.; Han, G.; Taubert, L.; Trouve, L.; Wygnanski, I.; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 369-405; In English; See also 20050192624; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

In this paper we examine a series of circulation control experiments using different control strategies such as steady blowing, suction and periodic excitation from a narrow slot. The latter is often referred to as Active Flow Control (AFC). The impact of flow control is discussed for the cylinder, a standard airfoil and an elliptic airfoil.
Author
Circulation Control Airfoils; Experimentation; Flow Distribution

20050192639 Naval Surface Warfare Center, Bethesda, MD, USA
Full-Reynolds Stress Modeling of Circulation Control Airfoils
Chang, Peter A., III; Slomski, Joseph; Marino, Thomas; Ebert, Michael P.; Abramson, Jane; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 141-166; In English; See also 20050192624; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The flow about the NCCR 1510-7067N elliptical circulation control (CC) airfoil is computed with compressible Navier-Stokes equations and full Reynolds Stress turbulence modeling (FRSM). This airfoil, with a slot on its upper surface at 97% chord, has been run with both circular and logarithmic spiral trailing edges. The hybrid structured/unstructured grids, consisting primarily of quadrilaterals, with triangles in the slot region, have between 100,000 and 150,000 cells. The free stream Reynolds number, based on chord, is 5.45 105 with a free stream Mach number of 0.12. We run three variations in the slot height to chord (h/c) of 0.0015, 0.0022 and 0.0030. The non-dimensional blowing rates are varied from 0.05 to 0.20. For h/c = 0.0030 we run 0 deg, - 4 deg and -8 deg angles of attack.
Author (revised)
Turbulence Models; Reynolds Stress; Navier-Stokes Equation; Circulation Control Airfoils

20050194568 NASA Glenn Research Center, Cleveland, OH, USA
Planar Particle Imaging Doppler Velocimetry Developed
Wernet, Mark P.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Two current techniques exist for the measurement of planar, three-component velocity fields. Both techniques require multiple views of the illumination plane in order to extract all three velocity components. Particle image velocimetry (PIV) is a high-resolution, high accuracy, planar velocimetry technique that provides valuable instantaneous velocity information in aeropropulsion test facilities. PIV can provide three-component flow-field measurements using a two-camera, stereo viewing configuration. Doppler global velocimetry (DGV) is another planar velocimetry technique that can provide three component flow-field measurements; however, it requires three detector systems that must be located at oblique angles from the measurement plane. The three-dimensional configurations of either technique require multiple (DGV) or at least large (stereo PIV) optical access ports in the facility in which the measurements are being conducted. Optical access is extremely limited in aeropropulsion test facilities. In many cases, only one optical access port is available. A hybrid measurement technique has been developed at the NASA Glenn Research Center, planar particle image and Doppler velocimetry (PPIDV), which combines elements from both the PIV and DGV techniques into a single detection system that can measure all three components of velocity across a planar region of a flow field through a single optical access port. In the standard PIV technique, a pulsed laser is used to illuminate the flow field at two closely spaced instances in time, which are recorded on a 'frame-straddling' camera, yielding a pair of single-exposure image frames. The PIV camera is oriented perpendicular to the light sheet, and the processed PIV data yield the two-component velocity field in the plane of the light sheet. In the standard DGV technique, an injection-seeded Nd:YAG pulsed laser light sheet illuminates the seeded flow field, and three receiver systems are used to measure three components of velocity. The receiver systems are oriented at oblique angles to the light sheet in order to accurately resolve the three-component velocity. Each DGV receiver system contains two cameras, which share

a common view of the illuminated flow through a beam-splitting cube. One camera views the illuminated flow directly (reference camera) and the second camera images the illuminated flow through an iodine vapor cell (signal camera). The laser frequency (wavelength) is adjusted so that the Doppler-shifted light from particles in the flow falls on an iodine absorption feature, see the following graph. The iodine vapor cell acts as a frequency-to-velocity filter by modulating the intensity of the transmitted light as a function of the flow velocity (Doppler shift). The ratio of the signal and reference images yields the component of the flow velocity along the bisector of the laser sheet propagation direction and the receiver system observation direction. The hybrid system employs a single-component DGV receiver system configured to simultaneously acquire PIV image data, as shown in the following diagram. The cameras used in the DGV receiver are replaced with PIV frame-straddling cameras, and the receiver system views the illuminated light sheet plane at 90 (as in the standard PIV configuration).
Author
Particle Image Velocimetry; Planar Structures; Doppler Effect

20050194574 NASA Glenn Research Center, Cleveland, OH, USA
Two-Dimensional Bifurcated Inlet Variable Cowl Lip Test Completed in 10- by 10-Foot Supersonic Wind Tunnel
Hoffman, T. R.; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Researchers at the NASA Glenn Research Center at Lewis Field successfully tested a variable cowl lip inlet at simulated takeoff conditions in Glenn s 10- by 10-Foot Supersonic Wind Tunnel (10x10 SWT) as part of the High-Speed Research Program. The test was a follow-on to the Two-Dimensional Bifurcated (2DB) Inlet/Engine test. At the takeoff condition for a High-Speed Civil Transport aircraft, the inlet must provide adequate airflow to the engine with an acceptable distortion level and high-pressure recovery. The test was conducted to study the effectiveness of installing two rotating lips on the 2DB Inlet cowls to increase mass flow rate and eliminate or reduce boundary layer flow separation near the lips. Hardware was mounted vertically in the test section so that it extended through the tunnel ceiling and that the 2DB Inlet was exposed to the atmosphere above the test section. The tunnel was configured in the aerodynamic mode, and exhausters were used to pump down the tunnel to vacuum levels and to provide a maximum flow rate of approximately 58 lb/sec. The test determined the (1) maximum flow in the 2DB Inlet for each variable cowl lip, (2) distortion level and pressure recovery for each lip configuration, (3) boundary layer conditions near variable lips inside the 2DB Inlet, (4) effects of a wing structure adjacent to the 2DB Inlet, and (5) effects of different 2DB Inlet exit configurations. It also employed flow visualization to generate enough qualitative data on variable lips to optimize the variable lip concept. This test was a collaborative effort between the Boeing Company and Glenn. Extensive inhouse support at Glenn contributed significantly to the progress and accomplishment of this test.
Author
Engine Inlets; Supersonic Wind Tunnels; Two Dimensional Flow; Cowlings; Wind Tunnel Tests; Civil Aviation; Aerodynamic Configurations

20050194626 Wisconsin Univ., Madison, WI, USA
CAREER: An Experimental MHD Dynamo
Nov. 15, 2002; 18 pp.; In English
Report No.(s): DE2005-824454; No Copyright; Avail: Department of Energy Information Bridge

The project is designed to understand current and magnetic field generation in plasmas and other magnetohydrodynamic systems. The experiments will investigate the generation of a dynamo using liquid Na.
NTIS
Dynamo Theory; Liquid Sodium; Magnetic Fields; Magnetohydrodynamics; Rotating Generators; Space Plasmas

20050194627 Reservoir Engineering Research Inst., Palo Alto, CA, USA
Fractured Petroleum Reservoirs
Firoozabadi, A.; Jun. 11, 1999; 288 pp.; In English
Report No.(s): DE2005-825891; No Copyright; Avail: Department of Energy Information Bridge

The four chapters that are described in this report cover a variety of subjects that not only give insight into the understanding of multiphase flow in fractured porous media but they provide also major contribution towards the understanding of flow processes with in-situ phase formation.
NTIS
Crude Oil; Industries; Mathematical Models; Reservoirs; Wetting

20050194684 Lawrence Livermore National Lab., Livermore, CA USA
Velocimetry Using Heterodyne Techniques
Strand, O. T.; Berzins, L. V.; Goosman, D. R.; Kuhlow, W. W.; Sargis, P. D.; Aug. 13, 2004; 14 pp.; In English
Report No.(s): DE2005-15014556; UCRL-CONF-206034; No Copyright; Avail: Department of Energy Information Bridge

At LLNL, we have been using heterodyne techniques for the past year and a half to measure velocities up to several kilometers-per-second on different types of experiments. We assembled this diagnostic, which we call the Heterodyne Velocimeter (HetV), using commercially available products developed for the communications industry. We use a 1550 nm fiber laser and single mode fibers to deliver light to and from the target. The return Doppler-shifted light is mixed with the original laser light to generate a beat frequency proportional to the velocity. At a velocity of 1000 m/s, the beat signal has a frequency of 1.29 GHz. We record the beat signals directly onto fast digitizers. The maximum velocity is limited by the bandwidth of the electronics and the sampling rate of the digitizers. The record length is limited by the amount of memory contained in the digitizers. This paper describes our approach to measuring velocities with this technique and presents recent data obtained with the HetV.
NTIS
Heterodyning; Velocity Measurement

20050194722 NASA Lewis Research Center, Cleveland, OH, USA
Customized Hermetic Feedthrough Developed to Isolate Fluids
Meredith, Roger D.; Research and Technology 1998; April 1999; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

A common problem occurs when refrigerant fluids wick inside the insulation of thermocouple wires through a compressor's casing feedthrough and then leak into the adjacent disconnect box outside the casing. Leaking fluids create an unfavorable situation inside the disconnect box and may contaminate the fluids. To address this problem, NASA Lewis Research Center s Manufacturing Engineering Division developed a customized hermetic feedthrough for a bank of Worthington compressors. In these compressors, bearing temperatures are measured by internal thermocouples embedded in bearings located inside the compressor casings. The thermocouple wires need to be routed outside the casing and read at another location. These wires are short and are terminated to a disconnect strip inside the casing. The bearings operate at about 170 F, but because the casing is filled with R12 refrigerant oil, the casing has a maximum temperature of about 100 F. The operating conditions of these compressors permit the use of an epoxy that is compatible with the R12 fluid. The desired finished product is a stainless steel tube that has been filled solid with epoxy after thermocouple wires bonded and sealed by epoxy have been inserted through its length. Shrink tubing extends from both ends of the tube. The process that was developed to isolate the thermocouple wires from the R12 fluid follows. For this application, use an 8-in.-long piece of 0.500-in. 304 stainless steel tube with six pairs of 24-gauge stranded, PTFE-insulated (polytetrafluoroethylene) type 'T' thermocouple wires for each feedthrough. Use shrink tubing to strain relief the insulated wires at their exit from the stainless steel tube. Cut the wire to length and identify the location of the stainless steel tube sleeve with masking tape. Then, remove the outer insulation from a 2-in. section of wire that will be inside the tube, and carefully strip to bare wire a 1-in. section in the middle of the section with the outer insulation removed. For an effective seal, the epoxy must penetrate between the strands when stranded conductors are used. Make the seal with epoxy bond on the bare wire. The bare wire must be encapsulated with a thin layer of the epoxy that leaves only a very low profile. These encapsulated wires must cure before the assembly can be continued. Then, inspect the cured wires for complete encapsulation before going to the next step. Insert the wires in the stainless steel tube and orient them so that the epoxied stripped sections are staggered within the tube; then, apply shrink tubing to one end of the cleaned wires, positioning it inside the edge of the tube. The small gaps between the wires on the other end will be used to inject the epoxy into the tube. Let the epoxy cure inside the tube, free of any voids. Then, continue to fill the tube until the entire 8-in. length is nearly filled, allowing room for the other strain-relieving shrink tubing. Since this first design, the process has been adjusted to fit many needs and situations. Customized feedthroughs have been assembled from various wire types, wire gauges, and/or stainless steel tube passages. The fittings selected to mount these feedthroughs allow their use in other areas, such as pressure or vacuum systems.
Author
Hermetic Seals; Fluids; Isolators; Refrigerants

20050195867 NASA Glenn Research Center, Cleveland, OH, USA
Nucleate Boiling Heat Transfer Studied Under Reduced-Gravity Conditions
Chao, David F.; Hasan, Mohammad M.; Research and Technology 1999; March 2000; 4 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Boiling is known to be a very efficient mode of heat transfer, and as such, it is employed in component cooling and in various energy-conversion systems. In space, boiling heat transfer may be used in thermal management, fluid handling and control, power systems, and on-orbit storage and supply systems for cryogenic propellants and life-support fluids. Recent interest in the exploration of Mars and other planets and in the concept of in situ resource utilization on the Martian and Lunar surfaces highlights the need to understand how gravity levels varying from the Earth's gravity to microgravity (1g = or \g g/g(sub e) = or \g 10(exp -6)g) affect boiling heat transfer. Because of the complex nature of the boiling process, no generalized prediction or procedure has been developed to describe the boiling heat transfer coefficient, particularly at reduced gravity levels. Recently, Professor Vijay K. Dhir of the University of California at Los Angeles proposed a novel building-block approach to investigate the boiling phenomena in low-gravity to microgravity environments. This approach experimentally investigates the complete process of bubble inception, growth, and departure for single bubbles formed at a well-defined and controllable nucleation site. Principal investigator Professor Vijay K. Dhir, with support from researchers from the NASA Glenn Research Center at Lewis Field, is performing a series of pool boiling experiments in the low-gravity environments of the KC 135 microgravity aircraft s parabolic flight to investigate the inception, growth, departure, and merger of bubbles from single- and multiple-nucleation sites as a function of the wall superheat and the liquid subcooling. Silicon wafers with single and multiple cavities of known characteristics are being used as test surfaces. Water and PF5060 (an inert liquid) were chosen as test liquids so that the role of surface wettability and the magnitude of the effect of interfacial tension on boiling in reduced gravity can be investigated.
Author (revised)
Nucleate Boiling; Heat Transfer; Microgravity; Weightlessness Simulation

20050195931 Rockwell Scientific Co., LLC, Thousand Oaks, CA USA
Mathematical Fluid Dynamics of Store and Stage Separation
Malmuth, Norman D.; Shalaev, V.; Fedorov, A.; May 2005; 226 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F499620-02-C-0024; F49620-99-0005
Report No.(s): AD-A434694; SC71193.RFRFTV; No Copyright; Avail: Defense Technical Information Center (DTIC)
To address the foregoing needs, the part of our research dealing with multi-body interactions we performed research to study store interaction with cavity bay shear layers relevant to separation and delivery with emphasis on the following tasks: 1. Continue combined asymptotic and numerical modeling of store separation and multibody flow processes 2. Investigate shock interactions relevant to stage separation 3. Develop combined dynamics and aerodynamic models for analysis of store and stage separation 4. Calculate examples of a slender body separation from a wing into a supersonic freestream Added to this scope of effort our objective was to develop the ultrasonic absorption coating technology so that ultimately it can be deployed on hypersonic flight vehicles for passive laminar flow control. A major objective was to mathematically simulate the energetics related to admittance of typical thermal protection system microstructures to tailor them to absorb energy of second mode instabilities leading to delay of laminar turbulent boundary layer transition.
DTIC
Flow Distribution; Fluid Dynamics; Stage Separation

20050196019 Scripps Institution of Oceanography, La Jolla, CA USA
Field Measurements of the Influence of Bubbles on the Inherent Optical Properties of the Upper Ocean
Terrill, Eric J.; Melville, W. K.; Stramski, Dariusz; May 2005; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-1-0190
Report No.(s): AD-A434825; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report describes the research performed on behalf of the Office of Naval Research to understand the influence of air-sea interaction processes on hyperspectral remote-sensing of the ocean's surface. The Hyperspectral Coupled Ocean Dynamics Experiment (HYCODE) and Monte Carlo Radiative model were used to investigate these processes, as well as newly refined acoustic techniques. A byproduct of this research will be models to correct for bubble mediated effects in measured hyperspectral light fields using wind and wave information. The program also presented an opportunity to develop techniques for inverting remotely-sensed hyperspectral imagery for in-situ bubble concentrations.
DTIC
Air Water Interactions; Bubbles; Measurement; Ocean Surface; Oceans; Optical Properties

20050196044 Woods Hole Oceanographic Inst., MA USA
Advances in the Visualization and Analysis of Boundary Layer Flow in Swimming Fish
Anderson, Erik J.; Feb. 2005; 250 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-1082; N00014-96-1141
Report No.(s): AD-A434861; MIT/WHOI-2005-01; No Copyright; Avail: CASI; A11, Hardcopy

In biology, the importance of fluid drag, diffusion, and heat transfer both internally and eternally, suggest the boundary layer as an important subject of the investigation the complexities of biological systems present significant and unique challenges to analysis by experimental fluid dynamics.

DTIC
Boundary Layer Flow; Fishes; Flow Visualization; Swimming

20050196097 Army Engineer Research and Development Center, Vicksburg, MS USA
Design of Low-Flow Channels
Fischenich, Craig; Aug. 2002; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434950; ERDC TN-EMRRP-SR-19; No Copyright; Avail: Defense Technical Information Center (DTIC)

Maintenance or restoration of physical aquatic habitat in streams during critical periods can often be accommodated with the development of low-flow channels, designed to concentrate flows and increase channel velocity and depth during low-flow periods. A procedure for the first-order approximation of a stable low-flow channel form based upon physical reasoning, empirical evidence, and constraints common to low-flow channel projects is presented in this technical note. Topics discussed include simplifying assumptions, limitations, and applicability.

DTIC
Channel Flow; Habitats

20050196613 NASA Glenn Research Center, Cleveland, OH, USA
Active Control of Rotating Stall Demonstrated for a Multistage Compressor With Inlet Distortion
VanSchalkwyk, Christian; Bright, Michelle M.; Suder, Kenneth L.; Straziar, Anthony J.; Thorp, Scott A.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Aircraft compressors can suffer debilitating consequences as a result of rotating stall and surge events caused by inlet distortions. This is particularly true of aircraft during takeoff, when the compressor is operating at peak performance close to the surge line. Significant research has been conducted by the NASA Glenn Research Center in the area of compressor stability enhancement through active and passive control methods. Most recently, an experiment was conducted at the Wright Patterson Air Force Base Research Laboratory on a two-stage fan with inlet guide vanes and inlet distortion. In this joint Small Business Innovation Research effort between Scientific Systems and Glenn, control of rotating stall was demonstrated in a multistage transonic fan. This twostage fan with inlet guide vanes was tested under clean and distorted inlet conditions. The compressor was also configured with a circumferential distortion screen capable of 180 of distortion and with 14 high-velocity injectors upstream of the first rotor. Twelve of these injectors could oscillate up to frequencies of 450 Hz. The additional two injectors were located next to each other and were used in concert with each other as a single, on/off, high-authority actuator. In a first test of injection in this multistage environment, 12 of the valves were opened 50 percent of their full stroke to assess steady injection through the compressor. This baseline injection is shown in the compressor characteristic of the following figure, and stall margin improvements are tracked from this baseline condition. The compressor was then tested with clean inlet conditions using 12 injectors and active control. Pressure disturbances were tracked before rotating stall, and a constant gain control scheme reduced the stalling mass flow by 10.8 percent over the baseline. With the distortion screen present in the inlet, a pole-zero cancellation control scheme was used to achieve a 6.4-percent decrease in stalling mass flow. These improvements also are shown in the figure. In a final experiment, actively controlled, high-frequency injection from the 12 valves was used in conjunction with the high-authority actuators. In this test, the stalling mass flow of the compressor was reduced by 27 percent as indicated in the graph. These results were obtained by injecting less than 2 percent of the total compressor throughflow into the rotor tip region via 14 injection ports. These results mark the first successful demonstration of actively controlled air injection as a stall-control strategy for multistage compressors operating at speeds typical of an actual gas turbine engine. A goal of continuing research is to determine the combination of air-injection parameters and control strategies that are most effective in providing stall control for both clean and distorted inlet flow conditions for multistage environments. Other goals include the demonstration of stall control at many locations along the core compressor and development and application of active stall control strategies that will be integral flightworthy components of onboard engine hardware.

Author
Active Control; Inlet Flow; Rotating Stalls; Engine Inlets; Turbocompressors

20050196620 DYNACS Engineering Co., Inc., USA

Complex Flow Separation Pattern on Transonic Fan Airfoils Revealed by Flow Visualization

Lepicovsky, Jan; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Modern turbofan engines employ a highly loaded fan stage with transonic or low-supersonic velocities in the blade-tip region. The fan blades are often prone to flutter at off-design conditions. Flutter is a highly undesirable and dangerous self-excited mode of blade oscillations that can result in high-cycle fatigue blade failure. The origins of blade flutter are not fully understood yet. The latest view is that the blade oscillations are triggered by high-frequency changes in the extent of the partially separated area on the airfoil suction side. There is a lack of experimental data describing the separated flow characteristics of modern airfoils for transonic fans.

Derived from text

Airfoils; Fan Blades; Failure; Boundary Layer Control

20050196646 North Carolina State Univ., Raleigh, NC, USA

CFD Analysis of Circulation Control Airfoils Using Fluent

McGowan, Gregory; Gopalarathnam, Ashok; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 2; June 2005, pp. 813-843; In English; See also 20050196628; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

In an effort to validate computational fluid dynamics procedures for calculating flows around circulation control airfoils, the commercial flow solver FLUENT was utilized to study the flow around a general aviation circulation control airfoil. The results were compared to experimental and computational fluid dynamics results conducted at the NASA Langley Research Center. The current effort was conducted in three stages: 1. A comparison of the results for free-air conditions to those from experiments. 2. A study of wind-tunnel wall effects. and 3. A study of the stagnation-point behavior.

Author (revised)

Computational Fluid Dynamics; Circulation Control Airfoils; Wind Tunnel Walls

20050196665 NASA Glenn Research Center, Cleveland, OH, USA

Low Gravity Issues of Deep Space Refueling

Chato, David J.; July 2005; 15 pp.; In English; 43rd Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2005, Reno, NV, USA

Contract(s)/Grant(s): WBS 22-614-50-04-11

Report No.(s): NASA/TM-2005-213640; AIAA Paper 2005-1148; E-15124; No Copyright; Avail: CASI; A03, Hardcopy

This paper discusses the technologies required to develop deep space refueling of cryogenic propellants and low cost flight experiments to develop them. Key technologies include long term storage, pressure control, mass gauging, liquid acquisition, and fluid transfer. Prior flight experiments used to mature technologies are discussed. A plan is presented to systematically study the deep space refueling problem and devise low-cost experiments to further mature technologies and prepare for full scale flight demonstrations.

Author

Cryogenic Rocket Propellants; Refueling; Deep Space; Microgravity

20050196676 NASA Glenn Research Center, Cleveland, OH, USA

Thermocouple Rakes for Measuring Boundary Layer Flows Extremely Close to Surface

Hwang, Danny P.; Fralick, Gustave C.; Martin, Lisa C.; Blaha, Charles A.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Of vital interest to aerodynamic researchers is precise knowledge of the flow velocity profile next to the surface. This information is needed for turbulence model development and the calculation of viscous shear force. Though many instruments can determine the flow velocity profile near the surface, none of them can make measurements closer than approximately 0.01 in. from the surface. The thermocouple boundary-layer rake can measure much closer to the surface than conventional instruments can, such as a total pressure boundary layer rake, hot wire, or hot film. By embedding the sensors (thermocouples) in the region where the velocity is equivalent to the velocity ahead of a constant thickness strut, the boundary-layer flow profile can be obtained. The present device fabricated at the NASA Glenn Research Center microsystem clean room has a heater made of platinum and thermocouples made of platinum and gold. Equal numbers of thermocouples are placed both upstream and downstream of the heater, so that the voltage generated by each pair at the same distance from the surface is indicative of the difference in temperature between the upstream and downstream thermocouple locations. This voltage differential is a function

of the flow velocity, and like the conventional total pressure rake, it can provide the velocity profile. In order to measure flow extremely close to the surface, the strut is made of fused quartz with extremely low heat conductivity. A large size thermocouple boundary layer rake is shown in the following photo. The latest medium size sensors already provide smooth velocity profiles well into the boundary layer, as close as 0.0025 in. from the surface. This is about 4 times closer to the surface than the previously used total pressure rakes. This device also has the advantage of providing the flow profile of separated flow and also it is possible to measure simultaneous turbulence levels within the boundary layer.
Author
Boundary Layer Flow; Fabrication; Thermocouples; Rakes

20050196678 NASA Glenn Research Center, Cleveland, OH, USA
Development of a Hybrid RANS/LES Method for Turbulent Mixing Layers
Georgiadis, Nicholas J.; Alexander, J. Iwan D.; Reshotko, Eli; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Significant research has been underway for several years in NASA Glenn Research Center's nozzle branch to develop advanced computational methods for simulating turbulent flows in exhaust nozzles. The primary efforts of this research have concentrated on improving our ability to calculate the turbulent mixing layers that dominate flows both in the exhaust systems of modern-day aircraft and in those of hypersonic vehicles under development. As part of these efforts, a hybrid numerical method was recently developed to simulate such turbulent mixing layers. The method developed here is intended for configurations in which a dominant structural feature provides an unsteady mechanism to drive the turbulent development in the mixing layer. Interest in Large Eddy Simulation (LES) methods have increased in recent years, but applying an LES method to calculate the wide range of turbulent scales from small eddies in the wall-bounded regions to large eddies in the mixing region is not yet possible with current computers. As a result, the hybrid method developed here uses a Reynolds-averaged Navier-Stokes (RANS) procedure to calculate wall-bounded regions entering a mixing section and uses a LES procedure to calculate the mixing-dominated regions. A numerical technique was developed to enable the use of the hybrid RANS-LES method on stretched, non-Cartesian grids. With this technique, closure for the RANS equations is obtained by using the Cebeci-Smith algebraic turbulence model in conjunction with the wall-function approach of Ota and Goldberg. The LES equations are closed using the Smagorinsky subgrid scale model. Although the function of the Cebeci-Smith model to replace all of the turbulent stresses is quite different from that of the Smagorinsky subgrid model, which only replaces the small subgrid turbulent stresses, both are eddy viscosity models and both are derived at least in part from mixing-length theory. The similar formulation of these two models enables the RANS and LES equations to be solved with a single solution scheme and computational grid. The hybrid RANS-LES method has been applied to a benchmark compressible mixing layer experiment in which two isolated supersonic streams, separated by a splitter plate, provide the flows to a constant-area mixing section. Although the configuration is largely two dimensional in nature, three-dimensional calculations were found to be necessary to enable disturbances to develop in three spatial directions and to transition to turbulence. The flow in the initial part of the mixing section consists of a periodic vortex shedding downstream of the splitter plate trailing edge. This organized vortex shedding then rapidly transitions to a turbulent structure, which is very similar to the flow development observed in the experiments. Although the qualitative nature of the large-scale turbulent development in the entire mixing section is captured well by the LES part of the current hybrid method, further efforts are planned to directly calculate a greater portion of the turbulence spectrum and to limit the subgrid scale modeling to only the very small scales. This will be accomplished by the use of higher accuracy solution schemes and more powerful computers, measured both in speed and memory capabilities.
Author
Large Eddy Simulation; Mixing Layers (Fluids); Reynolds Averaging; Turbulent Mixing; Turbulent Flow

20050196679 NASA Glenn Research Center, Cleveland, OH, USA
Restraint of Liquid Jets by Surface Tension in Microgravity Modeled
Chato, David J.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Tension in Microgravity Modeled Microgravity poses many challenges to the designer of spacecraft tanks. Chief among these are the lack of phase separation and the need to supply vapor-free liquid or liquidfree vapor to the spacecraft processes that require fluid. One of the principal problems of phase separation is the creation of liquid jets. A jet can be created by liquid filling, settling of the fluid to one end of the tank, or even closing a valve to stop the liquid flow. Anyone who has seen a fountain knows that jets occur in normal gravity also. However, in normal gravity, the gravity controls and restricts the jet flow. In microgravity, with gravity largely absent, jets must be contained by surface tension forces. Recent NASA experiments in microgravity (Tank Pressure Control Experiment, TPCE, and Vented Tank Pressure Experiment, VTRE) resulted in a wealth

of data about jet behavior in microgravity. VTRE was surprising in that, although it contained a complex geometry of baffles and vanes, the limit on liquid inflow was the emergence of a liquid jet from the top of the vane structure. Clearly understanding the restraint of liquid jets by surface tension is key to managing fluids in low gravity. To model this phenomenon, we need a numerical method that can track the fluid motion and the surface tension forces. The fluid motion is modeled with the Navier-Stokes equation formulated for low-speed incompressible flows. The quantities of velocity and pressure are placed on a staggered grid, with velocity being tracked at cell faces and pressure at cell centers. The free surface is tracked via the introduction of a color function that tracks liquid as 1/2 and gas as -1/2. A phase model developed by Jacqmin is used. This model converts the discrete surface tension force into a barrier function that peaks at the free surface and decays rapidly. Previous attempts at this formulation have been criticized for smearing the interface. However, by sharpening the phase function, double gridding the fluid function, and using a higher order solution for the fluid function, interface smearing is avoided. These equations can be rewritten as two coupled Poisson equations that also include the velocity. The method of solution is as follows: first, the phase equations are solved from this solution, a velocity field is generated, then a successive overrelaxation scheme is used to solve for a pressure field consistent with the velocity solution. After the code was implemented in axisymmetric form and verified by several test cases, the drop tower runs of Aydelott were modeled. The model handed the free-surface deformation quite nicely, even to the point of modeling geyser growth in the regime where the free surface was no longer restrained. A representative run is shown.
Author
Jet Flow; Liquid Flow; Microgravity; Interfacial Tension

20050196729 NASA Glenn Research Center, Cleveland, OH, USA
Buoyancy Suppression in Gases at High Temperatures
Kuczmarski, Maria A.; Gokoglu, Suleyman A.; [2005]; 32 pp.; In English
Contract(s)/Grant(s): 22-101-42-02
Report No.(s): E-15196; No Copyright; Avail: CASI; A03, Hardcopy
The computational fluid dynamics code FLUENT was used to study Rayleigh instability at large temperature differences in a sealed gas-filled enclosure with a cold top surface and a heated bottom wall (Benard problem). Both steady state and transient calculations were performed. The results define the boundaries of instability in a system depending on the geometry, temperature and pressure. It is shown that regardless of how fast the bottom-wall temperature can be ramped up to minimize the time spent in the unstable region of fluid motion, the eventual stability of the system depends on the prevailing final pressure after steady state has been reached. Calculations also show that the final state of the system can be different depending on whether the result is obtained via a steady-state solution or is reached by transient calculations. Changes in the slope of the pressure-versus-time curve are found to be a very good indicator of changes in the flow patterns in the system.
Author
Buoyancy; Computational Fluid Dynamics; Flow Distribution; Mathematical Models; High Temperature Gases

20050196778 Lawrence Livermore National Lab., Livermore, CA USA
Architectural Tour of BlueGene/L
Dossa, D.; Dec. 02, 2004; 10 pp.; In English
Report No.(s): DE2005-15014450; UCRL-CONF-208337; No Copyright; Avail: Department of Energy Information Bridge
BlueGene/L has been designed and built by IBM in close cooperation with the US Department of Energy, with Lawrence Livermore National Lab having a lead technical role. The system, to be delivered in late 2004 through early 2005, will consist of 131,072 IBM PowerPC 440 CPUs, each of which has a dual 64 bit wide floating point processor. The system runs at 700 MHz, providing a theoretical peak of 360 Teraflop/s.
NTIS
Confinement; Hydrodynamics

20050196783 Lawrence Livermore National Lab., Livermore, CA USA
Turbulence Kinetic Energy Budgets and Dissipation Rates in Disturbed Stable Boundary Layers
Lundquist, J. K.; Piper, M.; Kosovic, B.; Jun. 23, 2004; 12 pp.; In English
Report No.(s): DE2005-15014311; UCRL-CONF-204854; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
Boundary Layers; Energy Budgets; Kinetic Energy; Turbulence; Turbulence Models

20050196789 Lawrence Livermore National Lab., Livermore, CA USA
Perfect Hydrodynamic Similarity and the Effect of Small-Scale Vortices on the Large-Scale Dynamics
Ryutov, D. D.; Remington, B. A.; Aug. 2003; 12 pp.; In English
Report No.(s): DE2005-15013739; UCRL-JRNL-200929; No Copyright; Avail: Department of Energy Information Bridge

In the laboratory experiments designed to reproduce hydrodynamical phenomena of relevance for astrophysics the Reynolds numbers, although very large, are usually smaller than in real astrophysical systems. If the hydrodynamic flow reaches the turbulent state, it may then happen that differences (related to the difference in Reynolds numbers) would appear in the global-scale motions of the two systems. The difficulty in studying this issue in high energy density laboratory experiments lies in that equations of state and transport coefficients are usually not very well known, so that the subtle effect of the Reynolds number may be easily obscured by experimental uncertainties. An approach has recently been suggested (D.D. Ryutov, B.A. Remington, Phys. Plasmas, 10, 2629, 2003) that allows one to circumvent this difficulty and isolate the effect of the Reynolds number. In the present paper, after presenting a summary of the previous results, we briefly discuss various aspects of possible experiments.
NTIS
Analogies; Flow Distribution; Hydrodynamics; Vortices

20050199431 NASA Glenn Research Center, Cleveland, OH, USA, Army Research Lab., Cleveland, OH, USA
Vapor/Mist Used to Lubricate Gears After Loss of Primary Lubrication System
Handschuh, Robert F.; Morales, Wilfredo; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Loss of lubrication in rotorcraft drive systems is a demanding requirement placed on drive system manufacturers. The drive system must operate for at least 30 minutes once the primary lubrication system has failed. This test is a military requirement that must be passed prior to certification of the aircraft. As new aircraft engines, operating at higher speeds, are fielded, the requirements for the drive system become increasingly more difficult. Also, the drive system must be lightweight, which minimizes the opportunity to use the gear bodies to absorb the tremendous amount of heating that takes place. In many cases, the amount of heat generated because of the high speed and load requires an emergency lubrication system that negatively impacts the aircraft's weight, complexity, and cost. A single mesh spur gear test rig is being used at the NASA Glenn Research Center to investigate possible emergency lubrication system improvements that will minimize the impact of having these systems onboard rotorcraft. A technique currently being investigated uses a vapor/mist system to lubricate the contacting surfaces after the primary lubrication system has been shut down. A number of tests were conducted in which the vapor/mist used the same lubricant as the primary system, but at a greatly reduced flow rate. Each test was initiated with the primary lubrication system operational and at steady-state conditions for a given speed and load. Then the primary lubrication system was shut down, and the vapor/mist lubrication system was initiated. An example of the tests conducted is shown in the figures. These preliminary tests have uncovered a mechanism that provides a lubricious, carbonaceous solid on the surface that actually reduces the surface temperature of the meshing gear teeth during operation. Surface analysis of the carbonaceous solid revealed it was graphitic. This mechanism is the synthetic lubricant 'coking' on the active profile of the gears, which reduces the friction between the contacting gear surfaces. The level of load affects the onset of this mechanism: the higher the load, the sooner coking takes place. Future work will investigate several other factors that could improve the already promising results that have been attained.
Author
Lubrication Systems; Lubricants; Gear Teeth; Loads (Forces); Vapors; Mist; Flow Velocity

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20050188591 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Limitations in Time Resolved Photoluminescence of Gallium Nitride Using a Streak Camera
Jost, Thomas R.; Mar. 2005; 102 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434205; AFIT/GAP/ENP/05-04; No Copyright; Avail: CASI; A06, Hardcopy

Semiconductor performance is often characterized in terms of the rate at which its carrier recombination processes occur.

Carrier recombination, including radiative, and Shockley-Read-Hall and Auger (both nonradiative), occurs at ultra-fast times in the picosecond or femtosecond regimes. A device which can measure both spectral data and temporal phenomena at this speed is the streak camera. The capability to do time-resolved spectroscopy of wide band gap semiconductors using a streak camera has been established at AFIT for the first time. TRPL from samples of gallium nitride were measured at temperatures of 5 K over spectral bands of 36.6 and temporal ranges of 45 to 1970 ps, both instrument-limited. TRPL features at 3552 and 3587 were studied giving decay lifetimes of 43.2 1.6 ps and 16.8 3.4 ps, respectively. Shockley-Read-Hall, Radiative and Auger coefficients were found but parameterized in terms of experimental efficiency, n, which was not measured. These values, determined using a least-squares-error fit of the carrier recombination rate equation to collected data, are -9.3*109 4.9*108 s-1, 7.5*1017 n 8.0*1016 n cm3/s, and 1. 8*1025 n2 2.9*1024 n2 cm 6/s respectively, for the first peak and -2.5 *1010 5. 2*109 s-1, 4.9*1019 n 2.0*1019 n cm3/s and -1.4*1028 n2 8.6*1027 n2 cm6/s for the second peak. Since alignment of the streak camera has not yet been optimized, large but unquantified uncertainty in these results exists. Isolating vibrations and improving streak camera alignment should reduce the uncertainty and permit data collection temporally resolved at hundreds of femtoseconds.
DTIC
Gallium Nitrides; Photoluminescence; Semiconductors (Materials); Streak Cameras

20050188610 Joint Chiefs of Staff, Washington, DC USA
Joint Tactics, Techniques, and Procedures for Laser Designation Operations
May 1999; 150 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434233; JCS-PUB-3-09.1; No Copyright; Avail: CASI; A07, Hardcopy

This publication has been prepared under the direction of the Chairman of the Joint Chiefs of Staff. It sets forth doctrine and selected joint tactics, techniques, and procedures (JTTP) to govern the joint activities and performance of the Armed Forces of the USA in joint operations and provides the doctrinal basis for US military involvement in multinational and interagency operations. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders and prescribes doctrine and selected tactics, techniques, and procedures for joint operations and training. It provides military guidance for use by the Armed Forces in preparing their appropriate plans. It is not the intent of this publication to restrict the authority of the joint force commander (JFC) from organizing the force and executing the mission in a manner the JFC deems most appropriate to ensure unity of effort in the accomplishment of the overall mission.
DTIC
Laser Target Designators; Lasers; Military Operations; Tactics

20050188653 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA
Standardized UXO Technology Demonstration Site Blind Grid Scoring Record Number 312
Overbay, Larry, Jr.; Archiable, Robert; McClung, Christina; Robitaille, George; Mar. 2005; 54 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-DTC-8-CO-160-UXO-021
Report No.(s): AD-A434294; ATC-8865; No Copyright; Avail: CASI; A04, Hardcopy

This scoring record documents the efforts of Shaw Environmental, Inc. to detect and discriminate inert unexploded ordnance (UXO) utilizing the YPG standardized UXO Technology Demonstration Site Blind Grid. The scoring record was coordinated by Larry Overbay and by the Standardized UXO Technology Demonstration Scoring Committee. Organizations on the committee include the U.S. Army Corps of Engineers, the Environmental Security Technology Certification Program, the Strategic environmental Research and Development Program, the Institute for Defense Analysis, the U.S. Army Environmental Center, and the U.S. Army Aberdeen Test Center.
DTIC
Ammunition; Ordnance; Scoring; Standardization

20050188715 Army Aviation and Missile Command, Redstone Arsenal, AL USA
History of the Chaparral/FAAR Air Defense System
Cagle, Mary T.; May 1977; 230 pp.; In English
Report No.(s): AD-A434389; No Copyright; Avail: CASI; A11, Hardcopy

The CHAPARRAL guided missile system, the 20-mm VULCAN gun, the Forward Area Alerting Radar, and the self-propelled HAWK missile system now in the active Army inventory represent the culmination of a long and perplexing search for an effective solution to the forward area low-altitude air defense problem. From the end of World War II until the

mid-1950's, the Ordnance Corps sought to meet the low-altitude threat through the modernization of existing artillery guns. During that period, a number of possible solutions to the problem were investigated, but few of them reached the hardware stage and only one -- the improved 40-mm self-propelled gun (DUSTER) -- was ever released to the Army supply system. Convinced that the achievement of a fully effective forward area air defense system would require a significant engineering breakthrough in fire control technology, the Chief of Ordnance set out to fulfill the requirement for an optimum weapon system through a series of evolutionary developments.
DTIC
Air Defense; Chaparral; Doppler Radar

20050188739 Engineer Research and Development Center, Alexandria, VA USA
Evaluating IFSAR and LIDAR Technologies Using ArcInfo: Red River Pilot Study
Damron, James J.; Daniel, Carlton; Jul. 2000; 122 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434465; ERDC/TEC-TR-01-2; No Copyright; Avail: Defense Technical Information Center (DTIC)

The 1997 Red River flood resulted in catastrophic damage to residential, commercial, industrial, agricultural, and public properties in large portions of the Red River Valley in Minnesota and North Dakota, and in the Province of Manitoba, Canada. In the aftermath of the flood, the U.S. and Canadian governments asked the International Joint Commission (IJC) to analyze the cause and effects and to recommend ways to reduce the impact of future floods. In support of the IJC study, the U.S. Army Engineer District, Saint Paul, requested assistance from the U.S. Army Engineer Research and Development Center (ERDC), Topographic Engineering Center (TEC) to evaluate emerging airborne remote-sensing technologies for application to crisis management support. A pilot study was conducted using both Interferometric Synthetic Aperture Radar (IFSAR) and LIght Detection and Ranging (LIDAR) collection systems to determine the correct mix of technologies required. The major objectives of the study were to develop and implement a data fusion technique to merge IFSAR and LIDAR DEMs and to test the hydrological flow of water over each respective DEM. The results of this study will provide the Red River task force with a cost comparison for each of the technologies tested during this project and a list of recommendations for performing the remainder of the basin collection.
DTIC
Multisensor Fusion; Optical Radar; Rivers

20050188791 Air Force Research Lab., Hanscom AFB, MA USA
Detection of Underground Tunnels with a Synchronized Electromagnetic Wave Gradiometer
Stolarczyk, Larry G.; Troublefield, Robert; Battis, James; May 2005; 10 pp.; In English
Contract(s)/Grant(s): Proj-5063
Report No.(s): AD-A434554; AFRL-VS-HA-TR-2005-1066; No Copyright; Avail: CASI; A02, Hardcopy

Cross-border tunnels have been used by drug, people smugglers and terrorist organizations for clandestine entry or exit and transportation of contraband materials under the borders. The ability to detect these tunnels is paramount to successful border control. The Synchronized Electromagnetic Gradiometer uses the enhanced conductivity associated with tunnels, as compared to the surrounding medium, to detect the tunnels. A low-frequency electromagnetic (EM) signal is used to illuminate the area of interest. This signal in turn, induces current flow in any conductors within the tunnel that generate secondary EM fields observable at a distance from the tunnel. The magnitude of the secondary wave can be orders of magnitude less than the illuminating signal. An efficient detection system has been achieved by using a gradiometer design that suppresses the illuminating signal by more than 70 dB while maximizing the secondary signal with a narrow bandwidth (BW = 1Hz) synchronized receiver. This paper describes the performance of the Synchronized Electromagnetic Wave Gradiometer during several field studies and demonstration including the Otay Mesa cross-border tunnel near San Diego, California.
DTIC
Detection; Electromagnetic Fields

20050192483 Southern Vision Systems, Inc., Madison, AL, USA
Virtual Photodetectors: Building Your Own Detector
Whitehead, Andy; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 76-78; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Photodetectors are available in multiple configurations, with P point, quadrant, linear and 2-D arrays being among the better known. These devices offer optimal performance for dedicated tasks, and they require processing and digitizing electronics specific to each detector. The profusion of commercially available products can be intimidating when one sets out

to solve a detection task. Factors such as spectral response, bandwidth, signal-to-noise ratio, amplifier noise, detector area and sensitivity frequently are traded off one against the other. Virtual photodetectors offer users an element of flexibility: the ability to select the best compromise of these parameters in a package that also can be reprogrammed to do the same for the next photodetection provide digitally sampled signals at rates fast enough for most applications, they are enabled by the marriage of high-speed large-area imagers and field-programmable gate arrays. The devices offer the advantages of lower cost, a faster time to market and lower risk than custom photodetectors.
Derived from text
Photometers; Remote Sensors

20050192491 Space Telescope Science Inst., Baltimore, MD, USA
Phase 2 of Comparative NIR Detector Characterization for NGST
Figer, Donald; July 18, 2005; 5 pp.; In English
Contract(s)/Grant(s): NAG5-13317; STScI Proj. J1045; No Copyright; Avail: CASI; A01, Hardcopy

In accordance with NASA Grant and Cooperative Agreement Handbook, 1260.75 (c) (3), enclosed please find a citation of publications resulting from research for the above referenced grant entitled, 'Phase II of Comparative NIR Detector Characterization for NGST.' This list can also be accessed at http://idtl.stsci.edu/publications.htm. This project was completed with the failure of two Rockwell NIR detectors. The originally proposed measurements could not be completed.
Author
Next Generation Space Telescope Project; Infrared Detectors; Bibliographies

20050192623 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Fiber Sensor Uses Raman and Brillouin Scattering
Hitz, Breck; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 110-112; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Fiber sensors are replacing traditional transducers in many monitoring and measuring applications, a result of fiber sensors' superior reliability, longevity and flexibility to function in multiple sensing applications. In one example, these sensors have measured both strain and temperature when the fiber is illuminated with laser light and the signal reflected by Brillouin scattering is quantified. Such simultaneous measurement could be useful, for example, in real-time monitoring of the strain and temperature in a critical engine part.
Author
Optical Fibers; Optical Measuring Instruments; Raman Spectra; Brillouin Effect

20050194567 NASA Glenn Research Center, Cleveland, OH, USA
Reflective Focused Schlieren System Improved for Use in 10- by 10-Foot Supersonic Wind Tunnel
Williamson, Gary Scott; Research and Technology 1999; March 2000; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The reflective focused schlieren system that was developed for use in the 10- by 10-Foot Supersonic Wind Tunnel (10x10 SWT) at the NASA Glenn Research Center at Lewis Field as part of the Unstart Test Program was improved this past year. In April 1999, the development and use of the system was presented at the Supersonic Tunnel Association International in Bedford, England. A focused schlieren system is similar to a standard schlieren system in that shock waves coming from an object in supersonic flow can be seen using a standard video camera. Unlike the standard schlieren system, which produces a two-dimensional schlieren image, a focused schlieren system can produce a threedimensional image. The preceding drawing shows the components of the reflective focused schlieren system being developed for use in the 10x10 SWT. Although the system worked well for the Unstart Test Program, it was not sensitive enough to be classified as a facility capability. Therefore, a program was implemented to improve the sensitivity of the reflective focused schlieren system so that it could be a facility capability for Glenn's 10x10 SWT. Several techniques were implemented to increase the sensitivity and to improve the overall operation of the system. These included refinement of the source grid, improvement in the cutoff grid production, improvement of the source grid and cutoff grid alignment, installation of an improved light source, and incorporation of an image-enhancing system. These changes are being implemented with the system set up in the laboratory. A checkout test of the system is planned in the 10x10 SWT in March 2000. Of these techniques, the most developed is the refinement of the source grid. The original system had a pattern of -in. by -in. squares on -in. centers (distance between the center points of adjacent squares). This gave a ratio of light to dark (reflective to nonreflective area) of 3:1. The recommended ratio is 1:1. In order to accomplish this, a pattern of -in.-diameter dots on 3/8-in. centers was developed. Preliminary tests with this pattern showed an increase in system

sensitivity and image clarity. Further testing and refinement are scheduled. The former and improved dot patterns are shown. The use of glass plates to produce the cutoff grid improved the cutoff grid's quality and helped to align it with the source grid. The cutoff grid, which is the negative of the source grid, is made by exposing photography film (or glass plates) to the proper light while it is installed in the focused schlieren system. The exposed film or plate is removed from the system and then developed as a photograph negative. Because the glass plates are rigid, they eliminate the risk of distortion when the negative is reinstalled in the system and realigned with the source grid.
Author
Supersonic Wind Tunnels; Wind Tunnel Tests; Schlieren Photography; Reflectance

20050194719 NASA Lewis Research Center, Cleveland, OH, USA
Tracker: Image-Processing and Object-Tracking System Developed
Klimek, Robert B.; Wright, Theodore W.; Research and Technology 1998; April 1999; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Tracker is an object-tracking and image-processing program designed and developed at the NASA Lewis Research Center to help with the analysis of images generated by microgravity combustion and fluid physics experiments. Experiments are often recorded on film or videotape for analysis later. Tracker automates the process of examining each frame of the recorded experiment, performing image-processing operations to bring out the desired detail, and recording the positions of the objects of interest. It can load sequences of images from disk files or acquire images (via a frame grabber) from film transports, videotape, laser disks, or a live camera. Tracker controls the image source to automatically advance to the next frame. It can employ a large array of image-processing operations to enhance the detail of the acquired images and can analyze an arbitrarily large number of objects simultaneously. Several different tracking algorithms are available, including conventional threshold and correlation-based techniques, and more esoteric procedures such as 'snake' tracking and automated recognition of character data in the image. The Tracker software was written to be operated by researchers, thus every attempt was made to make the software as user friendly and self-explanatory as possible. Tracker is used by most of the microgravity combustion and fluid physics experiments performed by Lewis, and by visiting researchers. This includes experiments performed on the space shuttles, Mir, sounding rockets, zero-g research airplanes, drop towers, and ground-based laboratories. This software automates the analysis of the flame or liquid s physical parameters such as position, velocity, acceleration, size, shape, intensity characteristics, color, and centroid, as well as a number of other measurements. It can perform these operations on multiple objects simultaneously. Another key feature of Tracker is that it performs optical character recognition (OCR). This feature is useful in extracting numerical instrumentation data that are embedded in images. All the results are saved in files for further data reduction and graphing. There are currently three Tracking Systems (workstations) operating near the laboratories and offices of Lewis Microgravity Science Division researchers. These systems are used independently by students, scientists, and university-based principal investigators. The researchers bring their tapes or films to the workstation and perform the tracking analysis. The resultant data files generated by the tracking process can then be analyzed on the spot, although most of the time researchers prefer to transfer them via the network to their offices for further analysis or plotting. In addition, many researchers have installed Tracker on computers in their office for desktop analysis of digital image sequences, which can be digitized by the Tracking System or some other means. Tracker has not only provided a capability to efficiently and automatically analyze large volumes of data, saving many hours of tedious work, but has also provided new capabilities to extract valuable information and phenomena that was heretofore undetected and unexploited.
Author
Image Processing; Computer Programs; Microgravity; Tracking (Position); Systems Engineering

20050195843 NASA Glenn Research Center, Cleveland, OH, USA
Novel High Gas-Temperature Calibration System Demonstrated
Gokoglu, Suleyman A.; Schultz, Donald; Research and Technology 1999; March 2000; 3 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Accurate measurement of high gas temperatures, typically above 1300 K, has always presented challenges to researchers. Thermocouples often perturb the local gas flow and temperature field; they provide indirect information; and at high temperatures, they require large corrections so that actual gas temperatures can be determined. The physical and chemical stability of thermocouples to withstand the thermal loads and reactive environments prevailing at high temperatures naturally limits their life and maximum use temperature. Optical systems have their own drawbacks since accurate results depend on well-characterized emissivity, optical thickness, and gas composition information. These properties are rarely well known, especially in high-temperature, chemically reacting environments. In addition, optical systems usually require independent calibrations, which often involve the use of thermocouples, and hence, suffer from their aforementioned limitations. A new

technique developed by researchers at the NASA Glenn Research Center at Lewis Field exploits an abrupt increase in the emittance of optically thin materials at their unique melting temperatures for a direct determination of gas temperature. Pure metallic-oxide fibers, varying in diameter from 60 to 400 mm, have been used in measurements over a temperature range of 2050 to 2700 K. The accuracy and reproducibility of the technique is estimated to be 15 K: that is, within the uncertainty in the melting points of the materials. Other fiber materials with different, but unique, melting points could be used to extend the technique over a larger temperature range.
Derived from text
High Temperature Gases; Temperature Measuring Instruments; Calibrating; Metal Oxides; Metal Fibers

20050195887 NASA Glenn Research Center, Cleveland, OH, USA
High-Temperature Probe Station Developed to Characterize Microwave Devices Through 500 C
Downey, Alan N.; Schwartz, Zachary D.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

A photograph and a block diagram of the high-temperature probe station are shown. The system consists of the ceramic heater mounted on a NASA shuttle tile insulator, a direct current power supply, a personal-computer-based data acquisition and temperature controller, microwave probes, a microscope, and a network analyzer. The ability to perform microwave tests at high temperatures is becoming necessary. There is now a need for sensors and communication circuits that can operate at 500 C and above for aircraft engine development and monitoring during flight. To address this need, researchers have fabricated devices using wide bandgap semiconductors such as SiC with targeted operating temperatures of 500 to 600 C. However, the microwave properties of these devices often change drastically with temperature, so any designs that are intended to be used in such an environment must be characterized at high temperatures. For some reliability, lifetime, and direct-current testing, the device under test can be packaged and characterized in an oven. However, for RF and microwave measurements, it is usually not possible to establish a calibrated reference plane at the device terminals within a package. In addition, the characteristics of the package would vary over a 500 C temperature range, and this would have to be accounted for when the data were analyzed. A high temperature probe station allows circuits and devices to be characterized through on wafer measurements across a broad temperature range with known reference plane. The conventional, commercially available thermal wafer-probe stations that are used to evaluate microwave devices across a controlled temperature range have a typical upper limit of 200 C. Standalone thermal heating chucks are available with an extended upper temperature range of 300 to 400 C. To effectively characterize devices at temperatures up to and surpassing 500 C, Glenn researchers developed a custom probe station. In the past, custom probe stations have been developed to test devices under other extreme environments, such as cryogenic temperatures as low as 37 K. Similarly, this custom probe station was specifically modified for high-temperature use. It allows devices to be measured quickly and flexibly, without the use of wire bonds and test fixtures. The probe station is shown making scattering parameter measurements from 1 to 50 GHz with a Hewlett-Packard 8510C Network Analyzer. There is a half-wafer of silicon directly on top of the heater to provide a uniform heated platform for our sample. A quarter wafer of silicon carbide forms the substrate for our test circuit of several transmission lines.
Author
High Temperature; Microwave Probes; Mechanical Devices; Fabrication

20050195998 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
The Effect of False Physiological Feedback on Sexual Arousal in Sexually Functional and Dysfunctional Men
Sbrocco, Tracy; Jan. 2004; 257 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434799; No Copyright; Avail: Defense Technical Information Center (DTIC)

In the present study, a false feedback paradigm was used to manipulate the experience of seventy-six men to produce a discrepancy between actual and expected sexual performance. Thirty-nine men were diagnosed with male erectile disorder due to psychogenic factors, while the other thirty-seven were sexually functional. Experimental participants were provided with inflated feedback concerning the size of their erections while they viewed an erotic videotape. By examining changes in expectations of sexual performance, confidence, and tumescence over time, the impact of false feedback on sexual function was experimentally evaluated. It was proposed that inflated feedback would differentially modify cognitive set and penile tumescence in sexually functional and dysfunctional men. Based on prior studies, experimental groups were expected to show decreased erectile response, despite receiving inflated feedback. Functional men were expected to increase expectancies, while those of dysfunctional men were expected to decrease. Furthermore, functional men were expected to regain tumescence with additional exposure to erotica. Dysfunctional men were not expected to restore tumescence. Functionals responded to inflated feedback by increasing their expectancy associated with the feedback itself. While predicted tumescence and confidence did not increase, the functional men believed they experienced larger erections. Dysfunctionals also believed they had larger

erections and were more surprised by the inflated score than the functionals. However, dysfunctional men did not increase expectancies or confidence. The study found limited support for the idea that additional exposure to erotica restores tumescence. Neither group experienced a decrease in average tumescence, so there was no loss of tumescence to be 'restored.'
DTIC
Arousal; Feedback; Human Beings; Males; Physiology

20050196099 Army Research Lab., Adelphi, MD USA
Adaptive Target Detection FLIR Imagery Using the Eigenspace Separation Transform and Principal Component Analysis
Young, S. S.; Kwon, Heesung; Nasrabadi, Nasser M.; Jun. 2005; 26 pp.; In English
Report No.(s): AD-A434952; ARL-TR-3544; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this paper, an adaptive target detection algorithm for forward-looking infrared (FLIR) imagery is proposed which is based on measuring differences between structural information within a target and its surrounding background. At each pixel in the image a dual window is opened where the inner window (inner image vector) represents a possible target signature and the outer window (consisting of a number of outer image vectors) represents the surrounding scene. These image vectors are then preprocessed by two directional highpass filters to obtain the corresponding image gradient vectors. The target detection problem is formulated as a statistical hypotheses testing problem by mapping these image gradient vectors into two linear transformations, P1 and P2 and, via principal component analysis and eigenspace separation transform, respectively. The first transformation P1 is only a function of the inner image gradient vector. The second transformation P2 is a function of both the inner and outer image gradient vectors. For the hypothesis H1 (target): the difference of the two functions is small. For the hypothesis H0 (clutter): the difference of the two functions is large. Results of testing the proposed target detection algorithm on two large FLIR image databases are presented.
DTIC
Adaptation; Detection; Flir Detectors; Imagery; Infrared Instruments; Principal Components Analysis; Target Acquisition

20050196248 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Examination of Range and Doppler Mismatch and Their Effects on Radar Modeling
Izdepski, Gregory L.; Mar. 2005; 103 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435190; AFIT/GE/ENG/05-07; No Copyright; Avail: Defense Technical Information Center (DTIC)

A commonly accepted airborne phased array radar model simplifies the analytical derivation by assuming a waveform is perfectly matched in range and Doppler shift. This assumption means the matched filter output is effectively constant for all possible received scatterer Doppler and range mismatches, greatly simplifying the analytical development from that point forward. This research removes the matched Doppler and range assumption and examines the effects of several common waveforms on the model's fidelity along with the associated impact on radar performance, both non-adaptiveand adaptive. Analysis is completed using power spectral density comparisons and the fully adaptive output signal to interference plus noise ratio comparison. Results indicate that the model's fidelity is impacted little by the Time Frequency Auto Correlation Function. However, change in bandwidth from the compressed waveforms does impact the model. Increased bandwidth introduces more thermal noise which dominates clutter returns. Therefore, the clutter problem becomes less difficult. The trade-off is a reduction in the resolution capability of the clutter spectrum.
DTIC
Clutter; Waveforms

20050196271 IIT Research Inst., Chicago, IL USA
Rapid Prototyping: State of the Art
Freitag, Douglas; Wohlers, Terry; Philippi, Therese; Oct. 2003; 48 pp.; In English
Contract(s)/Grant(s): SPO700-97-D-4005
Report No.(s): AD-A435248; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report provides an overview of the current applications and technologies associated with rapid prototyping. It expands upon previous MTIAC reports on this topic and describes the status of equipment suppliers in terms of technical advancements, market size and share, existing and potential applications for rapid manufacturing, and the implications of this technology for the DoD.
DTIC
Laminates; Lithography; Manufacturing

20050196274 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A Line-of-Sight Sensor Network for Wide Area Video Surveillance: Simulation and Evaluation

Morrison, Jamie R.; Mar. 2005; 168 pp.; In English; Original contains color illustrations

Report No.(s): AD-A435251; AFIT/GCE/ENG/05-05; No Copyright; Avail: Defense Technical Information Center (DTIC)

Substantial performance improvement of a wide area video surveillance network can be obtained with the addition of a Line-of-Sight sensor. The research described in this thesis shows that while the Line-of-Sight sensor cannot monitor areas with the ubiquity of video cameras alone, the combined network produces substantially fewer false alarms and superior location precision for numerous moving people than video. Recent progress in the fabrication of inexpensive, robust CMOS-based video cameras have triggered a new approach to wide area surveillance of busy areas such as modeling an airport corridor as a distributed sensor network problem. Wireless communication between these cameras and other sensors make it more practical to deploy them in an arbitrary spatial configuration to unobtrusively monitor cooperative and non-cooperative people. The computation and communication to establish image registration between the cameras grows rapidly as the number of cameras increases. Computation is required to detect people in each image, establish a correspondence between people in two or more images, compute exact 3-D positions from each corresponding pair, temporally track targets in space and time, and assimilate resultant data until thresholds have been reached to either cause an alarm or abandon further monitoring of that person. Substantial improvement can be obtained with the addition of a Line-of-Sight sensor as a location detection system to decoupling the detection, localization, and identification subtasks. That is, if the 'where' can be answered by a location detection system, the 'what' can be addressed by the video most effectively.

DTIC

Automatic Control; Detectors; Line of Sight; Position Sensing; Reconnaissance; Simulation; Surveillance; Tracking (Position)

20050196560 NASA Glenn Research Center, Cleveland, OH, USA

Remote, Noncontact Strain Sensing by Laser Diffraction Developed

Freedman, Marc R.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

A system was developed at the NASA Glenn Research Center for continually monitoring, in real time, the in-plane strain tensor in opaque solids during high-temperature, long-term mechanical testing. The simple, noncontacting, strain-sensing methodology should also be suitable for measurement in hostile environments. This procedure has obvious advantages over traditional, mechanical, contacting techniques, and it is easier to interpret than moir and speckle interferometric approaches. A two-dimensional metallic grid of micrometer dimensions is applied to a metallographically prepared gauge section on the surface of a tensile test specimen by a standard photolithographic process. The grid on the fixtured specimen is interrogated by an He-Ne laser, and the resulting diffraction pattern is projected backwards onto a translucent screen. A charge-coupled device (CCD) camera is used to image the first-order diffraction peaks from the translucent screen. A schematic representation of the system is shown in the figure.

Derived from text

Detection; High Temperature; Real Time Operation; Remote Sensing; Solids; Tensile Tests

20050196565 Ohio Aerospace Inst., OH, USA, NASA Glenn Research Center, Cleveland, OH, USA

DART: Instrument Package Developed for Investigating Atmospheric Dust on Mars

Landis, Geoffrey A.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Mars' dust-filled atmosphere could be a significant problem for photovoltaic array operation during long missions on the surface of Mars. Measurements made by Pathfinder showed a 0.3-percent loss of solar array performance per day due to dust obscuration. Thus, dust deposition is the limiting factor in the lifetime of solar arrays for Martian power systems, and developing design tools to mitigate this deposition is important for long missions.

Derived from text

Instrument Packages; Mars Surface; Dust

20050196572 Ohio Aerospace Inst., OH, USA, NASA Glenn Research Center, Cleveland, OH, USA

Lightweight Sun-Position Sensor Developed

Landis, Geoffrey A.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

An orbiting spacecraft needs to be able to accurately locate the position of the Sun so that the solar arrays can be pointed toward the Sun. This not only maximizes the production of power, but it also helps the arrays find their orientation in space so that they can accurately point antennae at ground stations. As part of the work on the (now postponed) Mars-2001 Surveyor Lander, NASA Glenn Research Center engineers developed a new Sun sensor that is far lighter and simpler than earlier designs. This sensor uses the technology of a linear photodiode array to find the position of the Sun in one axis. Two of these sensors, used together, can locate the x and y coordinates of the Sun relative to the spacecraft. These sensors have a mass of only 18 g each, nearly an order of magnitude lighter than earlier designs. (This mass does not include the electronic circuit to read the photodiode output, which is on the experiment microcontroller.) Near the center of the field of view, the Sun position can be found to 0.15

Derived from text

Solar Arrays; Solar Sensors; Linear Arrays; Field of View

20050196656 Colorado Univ., Boulder, CO, USA

CO/H2 in Translucent Clouds

Green, James; [2005]; 1 pp.; In English

Contract(s)/Grant(s): NAG5-11490

Report No.(s): CU-1534914; No Copyright; Avail: CASI; A01, Hardcopy

A thorough examination of techniques to improve the resolution of the FUSE spectrograph was undertaken. These involved co-adding time tagged data very carefully so as to remove any blurs caused by drift. In addition, data was binned by detector pulse height bin (to eliminate any positional vs. gain variations, e.g. 'walk'). These techniques only resulted in an extremely modest increase in the spectral resolution, insufficient to allow the CO/H2 studies to be performed. The only remaining potential source of blur was defocus - implying the instrument was never properly focused on orbit. Private discussions with B.G. Anderson of the FUSE team resulted in my learning that this was in fact the case - the slidgrating distance was never optimized on orbit - resulting in a degradation of the peak performance of the instrument. Unfortunately, this was never publicized, even to myself, a member of the instrument tem and the spectrograph designer.

Author

Carbon Monoxide; Hydrogen; Spectrographs; Spectral Resolution

20050196677 NASA Glenn Research Center, Cleveland, OH, USA

Dynamic Pressure Probes Developed for Supersonic Flow-Field Measurements

Porro, A. Robert; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A series of dynamic flow-field pressure probes were developed for use in large-scale supersonic wind tunnels at the NASA Glenn Research Center. These flow-field probes include pitot and static pressure probes that can capture fast-acting flow-field pressure transients occurring on a millisecond timescale. The pitot and static probes can be used to determine local Mach number time histories during a transient event. The flow-field pressure probe contains four major components: 1) Static pressure aerodynamic tip; 2) Pressure-sensing cartridge assembly; 3) Pitot pressure aerodynamic tip; 4) Mounting stem. This modular design allows for a variety of probe tips to be used for a specific application. Here, the focus is on flow-field pressure measurements in supersonic flows, so we developed a cone-cylinder static pressure tip and a pitot pressure tip. Alternatively, probe tips optimized for subsonic and transonic flows could be used with this design. The pressure-sensing cartridge assembly allows the simultaneous measurement of steady-state and transient pressure which allows continuous calibration of the dynamic pressure transducer.

Derived from text

Pressure Sensors; Dynamic Pressure; Wind Tunnel Apparatus; Supersonic Test Apparatus; Flow Measurement; Transient Pressures

36
LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20050188669 Naval Observatory, Washington, DC USA

The Long-Term Stability of the U.S. Naval Observatory's Masers

Matsakis, Demetrios; Koppang, Paul; Garvey, R. M.; Jan. 2005; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434319; No Copyright; Avail: Defense Technical Information Center (DTIC)

The U. S. Naval Observatory (USNO) currently maintains 20 cavity-tuned hydrogen maser frequency standards at its Washington, DC (USNO-DC) and Alternate Master Clock (USNO-AMC) facilities, of which 13 have been in use for at least 7 years. This paper analyzes and characterizes the long-term frequency of these masers, as observed.
DTIC
Masers; Stability

20050188771 California Univ., Santa Barbara, CA USA
Plastic Optoelectronics: Injection Lasers Fabricated from Soluble Semiconducting Polymers
Heeger, Alan J.; Jan. 2002; 22 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0127
Report No.(s): AD-A434529; AFRL-SR-AR-TR-05-0210; No Copyright; Avail: CASI; A03, Hardcopy

Report includes the following principal accomplishment: Polymer Lasers, Field Effect Transistors (FETs) with two different metals as source and drain electrodes, and Polymer FETs with high current density. A list and 1 copy of 11 publications are included. A copy of the patent filed and issued on work that resulted from support from AF49620-02-1-0127 is also included.
DTIC
Electro-Optics; Fabrication; Field Effect Transistors; Injection Lasers; Polymers; Semiconductors (Materials)

20050192557 MacQuarie Univ., Australia
Raman Lasers Offer Power and Wavelength Versatility
Mildren, Richard P.; Pask, Helen M.; Piper, James A.; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, Issue 7, pp. 52-59; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Solid-state Raman lasers have emerged in recent years as powerful and efficient sources in spectral zones such as the yellow and orange that are difficult to access using conventional laser transitions. Output powers exceeding 1.5 W at 579 nm (the peak of oxyhemoglobin absorption) with pump-diode-to-visible efficiencies approaching 10 percent have been reported for compact diode end-pumped systems. The method uses Raman and sum-frequency media placed within the cavity of an Nd:YAG laser, taking advantage of the high intracavity field to enhance frequency conversion.
Derived from text
Raman Lasers; Solid State Lasers

20050192559 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Diode-Pumped Yb:WO, Laser Generates Femtosecond Pulses
Hitz, Breck; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, Issue 7, pp. 114-115; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Scientists at Belarus National Technical University and at Solix Ltd., both in Minsk, Belarus, and at the Swiss Federal Institute of Technology in Zurich have demonstrated - for what they believe is the first time - continuous-wave mode-locking of a n Yb:YVO4 laser. The result is noteworthy because Yb:YVO4 is a new laser material with several desirable properties - notably, a high thermal conductivity, a broad emission bandwidth and a very low quantum defect - and may prove to be the material of choice in commercial mode-locked thin-disk lasers. Yb:YAG currently is the favored material for such high-power lasers, and very high mode-locked outputs have been obtained with this material. Its drawback is its relatively narrow emission bandwidth, which sets a lower limit for mode-locked pulse duration at many hundreds of femtoseconds. Much shorter pulses, often less than 100 fs, have been reported from ytterbium lasers in crystalline hosts such a s KGW and BOYS, and from YB:glass lasers. But these materials have low thermal conductivity and, hence, are not suitable for high power operation. Two new materials, Yb:CaF2 and Yb:YVO4, combine high thermal conductivity with a broad emission bandwidth, offering the potential for high-power, sub-100-fs, mode-locked lasers. Observing that the emission spectrum of Yb:YVO4, is smoother than that of Yb:CaF2, the collaboration focused its investigation on that material.
Derived from text
Pulsed Lasers; Diodes; High Power Lasers

20050192560 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Good Quantum Defects Make Good Lasers
Hitz, Breck; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, Issue 7, pp. 113-114; In English; Original contains color illustrations; Copyright; Avail: Other Sources

The Quantum defect - the energy difference between a pump photon ad a laser photon - is one of the most significant parameters in selecting a potential laser material. Another one for a solid-state laser is the material's thermal ruggedness, or the amount of power it can absorb without physically rupturing. But there is a trade-off between the two: The larger a laser material's quantum defect, the more waste heat must absorb at a given pump level, and, hence, the greater its thermal ruggedness must be.
Derived from text
Lasers; Photons; Solid State Lasers

20050192641 National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Diffusing Wave Spectroscopy Used to Study Foams
Zimmerli, Gregory A.; Durian, Douglas J.; Research and Technology 1999; March 2000; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The white appearance of familiar objects such as clouds, snow, milk, or foam is due to the random scattering of light by the sample. As we all know, pure water is clear and easily passes a beam of light. However, tiny water droplets, such as those in a cloud, scatter light because the air and water droplet have different indexes of refraction. When many droplets, or scattering sites, are present, the incident light is scattered in random directions and the sample takes on a milky white appearance. In a glass of milk, the scattering is due to small colloidal particles. The white appearance of shaving cream, or foam, is due to the scattering of light at the water-bubble interface. Diffusing wave spectroscopy (DWS) is a laser light-scattering technique used to noninvasively probe the particle dynamics in systems that strongly scatter light. The technique takes advantage of the diffuse nature of light, which is reflected or transmitted from samples such as foams, dense colloidal suspensions (such as paint and milk), emulsions, liquid crystals, sandpiles, and even biological tissues.
Derived from text
Foams; Spectroscopy; Laser Outputs

20050194577 Laurin Publishing Co., Inc., Pittsfield, MA, USA, Imperial Cancer Research Fund, London, UK
Holey-Fiber Raman Laser Generates 3.6 W
Hitz, Breck; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, Issue 7, pp. 28-30; In English; Copyright; Avail: Other Sources

Researchers at Imperial College London have designed and operated what they believe is the first CW holey-fiber Raman laser constructed in an all-fiber configuration. Holey-fiber Raman lasers are important because their theoretical Raman gain coefficient is nearly seven times greater than that for conventional Raman-optimized fiber. Thus, these devices might someday replace conventional lasers in many applications, including telecommunications and research. Although the laser demonstrated at Imperial College did not achieve the sevenfold enhancement, it indicates that it is feasible. The researchers arranged their laser in an all-fiber arrangement, with no bulk optical elements. The advantages of eliminating bulk elements include an increase in stability resulting from the absence of spurious reflections from multiple interfaces, and a general increase in the compactness and ruggedness of the laser.
Derived from text
Fiber Lasers; Raman Lasers; Power Gain

20050195901 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Atmospheric Absorption Parameters for Laser Propagation
Rothman, Laurence S.; Mar. 2005; 25 pp.; In English
Contract(s)/Grant(s): F19628-02-C-0085; Proj-1010
Report No.(s): AD-A434606; AFRL-VS-HA-TR-2005-1037; No Copyright; Avail: CASI; A03, Hardcopy

The ability of high-energy lasers to penetrate the terrestrial atmosphere without loss of energy or focus has been the primary focus of this project. The task developed here has been to improve the line positions, intensities, and air-broadened half-widths of water vapor, carbon dioxide, carbon monoxide, and methane in the spectral regions of candidate high-energy lasers. This effort required acquisition of new high-resolution, high photometric accuracy spectroscopic data, as well as the applications of quantum mechanical theoretical calculations. The results, after validation, evaluation and comparison with current data, have been cast into the format of the HITRAN molecular spectroscopic data base. HITRAN is the input for

standardized high-resolution transmission and radiance codes, enabling assessment of laser performance among other applications.
DTIC
Atmospheric Attenuation; High Power Lasers; Lasers

20050196048 SVT Associates, Inc., Eden Prairie, MN USA
Development of III-V Terahertz Quantum Cascade Lasers
Zaytsev, Sergey; Dabiran,; Feb. 2005; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-04-C-0027; DASG60-02-P-0129; Proj-STTR
Report No.(s): AD-A434866; AFRL-SR-AR-TR-05-0222; No Copyright; Avail: CASI; A03, Hardcopy

A very successful Phase I project on semiconductor THz laser has been carried out. Several innovative techniques have been demonstrated during the performance of this work. The most significant concept being a different approach to how the laser should be pumped, resulting in more efficient THz output generation. We called this concept Separate Electrical and Waveguide (SEW) structure that circumvents the radiation absorption in the doped waveguide region in a conventional THz device, leading to lower threshold and higher temperature operation. In addition, we have developed an electrical measurement to detect lasing threshold, and a packaging technique for solid, effective thermal contact during movement.
DTIC
Electrical Properties; Lasers; Quantum Cascade Lasers; Waveguides

20050196072 Air Force Academy, CO USA
Temporal Differential Gene Expression in Explanted Human Retinal Pigment Epithelial Cells at 0.5, 1.0, 3.0, 6.0, 12 and 24 Hours Post-Exposure to 1064 nm, 3.6 ns Pulsed Laser Light
Obringer, John W.; Johnson, Martin; May 2005; 51 pp.; In English
Contract(s)/Grant(s): USAFA F05611-02-P-0471
Report No.(s): AD-A434907; USAFA-TR-2005-05; No Copyright; Avail: CASI; A04, Hardcopy

The use of laser light for targeting devices and weapons has dramatically increased the likelihood that personnel will be exposed to laser energy during military operations. Expanded medical, research, and industrial laser use may lead to excessive risk of exposure of researchers and technicians and also during commercial applications. Further, the nature and importance of the biophysical mechanisms of photon-tissue interaction at such pulse widths and irradiance are not understood at the fundamental cell and molecular level. A human in vitro model for assessing laser-light damage to tissue at the cell and molecular level is desirable for scientific, political and fiduciary reasons. We assessed the sublethal insult to human retinal pigment epithelial cells using a cadaver organ donor explant system for genes differentially expressed 30 min. and 1,3,6,12 and 24 hours post-exposure using gene expression microarray technology (gene chip). It appears that pulse of laser light are sensed and markedly altered gene expression over time. The 120 pulses of 1064 nm light at 280 mJ per square centimeter appeared to induce the cells into cessation cycling. As expected the various genes assayed fluctuated in expression in all conceivable permutations.
DTIC
Biological Effects; Exposure; Gene Expression; Irradiation; Laser Damage; Laser Outputs; Light Beams; Military Operations; Pigments; Pulsed Lasers; Retina; Target Acquisition; Visual Acuity

20050196582 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Optically Pumped Carbon Monoxide Cascade Laser
Sawruk, Nicholas W.; Jul. 2005; 115 pp.; In English
Report No.(s): AD-A435119; No Copyright; Avail: CASI; A06, Hardcopy

The experimental and theoretical results of an optically pumped vibrational CO laser are explored. A tunable 1550-1580nm optical parametric oscillator laser was used as a pulsed pump source. The OPO pumped the R(6) through R(9) (3,0) overtone band of the CO, which induced lasing on the (3,2) and (2,1) bands around 4.7% The laser output was spectrally separated to determine the spectral and temporal evolution of the CO lasing pulse. The influence of CO pressure, cell length, pump pulse intensity, and the resonator Q-Factor on the CO laser pulse temporal profile and spectral distribution were studied. A numerical model was developed, and the experimental results are compared to the model predictions.
DTIC
Carbon Monoxide Lasers; Optical Pumping

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20050192554 Omega Optical, Inc., Brattleboro, VT, USA

The Pros and Cons of Protected and Surface Coatings for High-Phase-Thickness Applications

Johnson, Robert L., Jr.; Hardee, Chris; Photonics; July 2005; ISSN 0731-1230; Volume 39, Issue 7, pp. 60-65; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Meta1 salt compounds, or dielectrics, produce thin-film coatings with precise spectral control. Because they are soft and require glass coverslips laminated to the coating substrate to protect them from damage, they are called protected coatings. Refractory metal-oxide materials, although hard and not in need of a protective glass layer, produce coatings that can demonstrate spectral shift over time, called durable surface coatings. When examining the pros and cons of coating technology, it becomes obvious that neither type is ideal for every application. World-class filter manufacturers typically use both technologies for complicated, high- phase-thickness applications and know their attributes and limitations. Understanding these pros and cons leads to a 'best fit' between customer needs and filter technology. The bottom line is that filter solutions should be based on a careful and balanced consideration of all requirements, including spectral performance, filter life and cost.

Derived from text

Coatings; Protective Coatings; Thickness

20050194573 NASA Glenn Research Center, Cleveland, OH, USA

New Compressor Added to Glenn's 450- psig Combustion Air System

Swan, Jeffrey A.; Research and Technology 1999; March 2000; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

In September 1999, the Central Process Systems Engineering Branch and the Maintenance and the Central Process Systems Operations Branch, released for service a new high pressure compressor to supplement the 450-psig Combustion Air System at the NASA Glenn Research Center at Lewis Field. The new compressor, designated C-18, is located in Glenn s Central Air Equipment Building and is remotely operated from the Central Control Building. C-18 can provide 40 pounds per second (pps) of airflow at pressure to our research customers. This capability augments our existing system capacity (compressors C 4 at 38 pps and C-5 at 32 pps), which is generated from Glenn's Engine Research Building. The C-18 compressor was originally part of Glenn's 21-Inch Hypersonic Tunnel, which was transferred from the Jet Propulsion Laboratory to Glenn in the mid-1980's. With the investment of construction of facilities funding, the compressor was modified, new mechanical and electrical support equipment were purchased, and the unit was installed in the basement of the Central Air Equipment Building. After several weeks of checkout and troubleshooting, the new compressor was ready for long-term, reliable operations. With a total of 110 pps in airflow now available, Glenn is well positioned to support the high-pressure air test requirements of our research customers.

Author

Combustion; Compressors; Hypersonic Wind Tunnels; Systems Engineering; Air Flow

20050194589 NASA Glenn Research Center, Cleveland, OH, USA, Ohio Aerospace Inst., OH, USA, Texas A&M Univ., TX, USA

Failure Accommodation Tested in Magnetic Suspension Systems for Rotating Machinery

Provenza, Andy J.; Research and Technology 1999; March 2000; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Glenn Research Center at Lewis Field and Texas A&M University are developing techniques for accommodating certain types of failures in magnetic suspension systems used in rotating machinery. In recent years, magnetic bearings have become a viable alternative to rolling element bearings for many applications. For example, industrial machinery such as machine tool spindles and turbomolecular pumps can today be bought off the shelf with magnetically supported rotating components. Nova Gas Transmission Ltd. has large gas compressors in Canada that have been running flawlessly for years on magnetic bearings. To help mature this technology and quiet concerns over the reliability of magnetic bearings, NASA researchers have been investigating ways of making the bearing system tolerant to faults. Since the potential benefits from an oil-free, actively controlled bearing system are so attractive, research that is focused on assuring system reliability and safety is justifiable. With support from the Fast Quiet Engine program, Glenn's Structural Mechanics and

Dynamics Branch is working to demonstrate fault-tolerant magnetic suspension systems targeted for aerospace engine applications. The Flywheel Energy Storage Program is also helping to fund this research.
Derived from text
Magnetic Bearings; Magnetic Suspension

20050194727 NASA Lewis Research Center, Cleveland, OH, USA
Silicon Carbide Being Developed for High-Definition Television (HDTV) Transmitter Modules
Costello, Donald E.; Research and Technology 1998; April 1999; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Through a Space Act Agreement, the NASA Lewis Research Center has helped develop the base silicon carbide (SiC) epitaxial growth technology for Westinghouse's efforts to bring silicon carbide products to the marketplace. SiC is a high-temperature, high-voltage semiconductor that can deliver greater than three times the power of conventional silicon devices. The technology was initially disclosed in the 1994 R&T report. NASA Lewis High Temperature Integrated Electronics and Sensors (HTIES) team is developing SiC as a material for advanced semiconductor electronic device applications because SiC-based electronics and sensors can operate in hostile environments where conventional silicon-based electronics cannot function. SiC transmitters hold great promise for television stations because they can convert broadcasts from analog to digital signals. A modular solid-state design provides broadcasters with an option to gradually add modules, increasing the power of their transmitters as they expand their high-definition television (HDTV) coverage. Using these high-power transistors will significantly reduce the space needed for high-power transmitters at television stations and will offer a solid-state solution, reducing long-term maintenance costs. Thus, transmitter manufacturers will be able to abandon their reliance on tube-based technology for high-power transmitters and will be able to build smaller, high-power, solid-state transmitters.
Author
High Definition Television; Modules; Silicon Carbides; Transmitters; Semiconductors (Materials)

20050195830 NASA Glenn Research Center, Cleveland, OH, USA
Effects of Various Heat Treatments on the Ballistic Impact Properties of Inconel 718 Investigated
Pereira, J. Michael; Lerch, Bradley A.; Research and Technology 1999; March 2000; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Uncontained failures of aircraft engine fan blades are serious events that can cause equipment damage and loss of life. Federal Aviation Administration (FAA) certification requires that all engines demonstrate the ability to contain a released fan blade with the engine running at full power. However, increased protection generally comes at the expense of weight. Proper choice of materials is therefore imperative to an optimized design. The process of choosing a good casing material is done primarily through trial and error. This costly procedure could be minimized if there was a better understanding of the relationships among static material properties, impact properties, and failure mechanisms. This work is part of a program being conducted at the NASA Glenn Research Center at Lewis Field to study these relationships. Ballistic impact tests were conducted on flat, square sheets of Inconel 718 that had been subjected to different heat treatments. Two heat treatments and the as-received condition were studied. In addition, results were compared with those from an earlier study involving a fourth heat treatment. The heat treatments were selected on the basis of their effects on the static tensile properties of the material. The impact specimens used in this study were 17.8-cm square panels that were centered and clamped over a 15.2-cm square hole in a 1.27-cm-thick steel plate. Three nominal plate thickness dimensions were studied, 1.0, 1.8, and 2.0 mm. For each thickness, all the specimens were taken from the same sheet of material. The projectile was a Ti-6Al-4V cylinder with a length of 25.4 mm, a diameter of 12.7 mm, and a mass ranging from 14.05 to 14.20 g. The projectiles were accelerated toward the specimens at normal incidence using a gas gun with a 2-m-long, 12.7-mm inner-diameter barrel. The ballistic limit for each heat treatment condition and thickness was determined by conducting a number of impact tests that bracketed as closely as possible the velocity required to penetrate the specimen.
Derived from text
Inconel (Trademark); Heat Treatment; Terminal Ballistics; Impact Tests

20050195833 Army Research Lab., Cleveland, OH, USA
Gear Durability Shown To Be Improved by Superfinishing
Krautz, Timothy L.; Research and Technology 1999; March 2000; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Gears, bearings, and similar mechanical elements transmit loads through contacting surfaces. At the NASA Glenn Research Center at Lewis Field, we postulated that the fatigue lives of gears could be improved by providing smoother tooth surfaces. A superfinishing process was applied to a set of conventionally ground, aerospace-quality gears. This process produced a highly polished, mirrorlike surface as shown in the preceding photograph. The surface fatigue lives of both superfinished and conventionally ground gears were measured by experiments. The superfinished gears survived about four times longer than the conventionally ground gears. These superfinished gears were produced from conventionally ground, aerospace-quality gears whose geometry had been inspected. The gears were superfinished by placing them in a vibrating bath consisting of water, detergent, abrasive powder, and small pieces of zinc. Upon removal from the bath, the surfaces were highly polished, as depicted in the preceding photograph. The gears were again inspected, and dimensional measurements made before and after the superfinishing operation were compared. Superfinishing removed the peaks of the grinding marks and left a much smoother surface. Profile and spacing checks proved that the overall gear tooth shape was not affected in any harmful way. Superfinishing uniformly removed approximately 2.5 microns from each surface.
Derived from text
Gears; Surface Finishing; Metal Polishing; Fatigue Life

20050195870 NASA Glenn Research Center, Cleveland, OH, USA
Strategy Developed for Selecting Optimal Sensors for Monitoring Engine Health
Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Sensor indications during rocket engine operation are the primary means of assessing engine performance and health. Effective selection and location of sensors in the operating engine environment enables accurate real-time condition monitoring and rapid engine controller response to mitigate critical fault conditions. These capabilities are crucial to ensure crew safety and mission success. Effective sensor selection also facilitates postflight condition assessment, which contributes to efficient engine maintenance and reduced operating costs. Under the Next Generation Launch Technology program, the NASA Glenn Research Center, in partnership with Rocketdyne Propulsion and Power, has developed a model-based procedure for systematically selecting an optimal sensor suite for assessing rocket engine system health. This optimization process is termed the systematic sensor selection strategy. Engine health management (EHM) systems generally employ multiple diagnostic procedures including data validation, anomaly detection, fault-isolation, and information fusion. The effectiveness of each diagnostic component is affected by the quality, availability, and compatibility of sensor data. Therefore systematic sensor selection is an enabling technology for EHM. Information in three categories is required by the systematic sensor selection strategy. The first category consists of targeted engine fault information; including the description and estimated risk-reduction factor for each identified fault. Risk-reduction factors are used to define and rank the potential merit of timely fault diagnoses. The second category is composed of candidate sensor information; including type, location, and estimated variance in normal operation. The final category includes the definition of fault scenarios characteristic of each targeted engine fault. These scenarios are defined in terms of engine model hardware parameters. Values of these parameters define engine simulations that generate expected sensor values for targeted fault scenarios. Taken together, this information provides an efficient condensation of the engineering experience and engine flow physics needed for sensor selection. The systematic sensor selection strategy is composed of three primary algorithms. The core of the selection process is a genetic algorithm that iteratively improves a defined quality measure of selected sensor suites. A merit algorithm is employed to compute the quality measure for each test sensor suite presented by the selection process. The quality measure is based on the fidelity of fault detection and the level of fault source discrimination provided by the test sensor suite. An inverse engine model, whose function is to derive hardware performance parameters from sensor data, is an integral part of the merit algorithm. The final component is a statistical evaluation algorithm that characterizes the impact of interference effects, such as control-induced sensor variation and sensor noise, on the probability of fault detection and isolation for optimal and near-optimal sensor suites.
Author
Systems Health Monitoring; Sensors; Rocket Engines; Optimization; Engine Tests

20050195888 NASA Glenn Research Center, Cleveland, OH, USA
Novel Biomedical Device Utilizing Light-Emitting Nanostructures Developed
Scardelletti, Maximilian C.; Goldman, Rachel; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Sketches and chemical diagrams of state-of-the-art device and novel proposed device are presented. Current device uses a diode laser that emits into a fluorescent fluid only one wavelength and a photodetector diode that detects only one wavelength. Only one type of bacteria can be detected. The proposed device uses a quantum dot array that emits into a

fluorescent fluid multiple wavelengths and an NIR 512 spectrometer that scans 0.8- to 1.7-mm wavelengths. Hundreds of different bacteria and viruses can be detected. A novel biomedical device is being developed at the NASA Glenn Research Center in cooperation with the University of Michigan. This device uses nano-structured quantum dots that emit light in the near-infrared (IR) region. The nanostructured quantum dots are used as a source and excite fluorochrome polymers coupled with antibodies that seek out and attach to specific bacteria and viruses. The fluorochrome polymers/antibodies fluoresce at specific wavelengths in the near-IR spectrum, but these wavelengths are offset from the excitation wavelength and can be detected with a tunable spectrometer. The device will be used to detect the presence of viruses and bacteria in simple fluids and eventually in more complex fluids, such as blood. Current state-of-the-art devices are limited to single bacteria or virus detection and a considerable amount of time and effort is required to prepare samples for analysis. Most importantly, the devices are quite large and cumbersome, which prohibits them from being used on the International Space Station and the space shuttles. This novel device uses nanostructured quantum dots which, through molecular beam epitaxy and highly selective annealing processes, can be developed into an illumination source that could potentially generate hundreds of specific wavelengths. As a result, this device will be able to excite hundreds of antibody/fluorochrome polymer combinations, which in turn could be used to detect hundreds of bacteria and viruses in fluids. A novel sample preparation technique that exploits micromembrane filtration and centrifugation methods has been developed for this device. The technique greatly reduces the time required to prepare the sample and the amount of sample needed to perform an accurate and comprehensive analysis. Last, and probably most important, because of the nano-light-emitting source and the novel sample preparation technique, the overall size of the device could be reduced dramatically. This device will serve as a nanoscale lab-on-a-chip for in situ microorganism detection and will enable tests to be performed on a time scale of minutes rather than days. Thus, it is ideally suited for monitoring the environmental conditions onboard the International Space Station and the space shuttles, thereby enhancing the safety of the astronauts. In addition, the device has important commercial applications, such as detecting the presence of bacteria and viruses in water at food- and beverage-processing centers, water treatment plants, and restaurants. Also, this technology has the potential to be used to detect bacteria and viruses in more complex fluids, such as blood--which in all likelihood would revolutionize blood analysis as it is performed today. This project was made possible through the Director's Discretionary Fund and is ongoing. In addition, this project provides funding to Dr. Rachel Goldman of the University of Michigan for the research and development of nanostructured quantum dots.
Author
Nanostructures (Devices); Bioinstrumentation; Light Emitting Diodes; Fabrication

20050196272 IIT Research Inst., Chicago, IL USA
Supply Chain Viability for the North American Microwave Power Tube Industry
Philippi, Therese M.; Sep. 2002; 45 pp.; In English
Contract(s)/Grant(s): SPO700-97-D-4005
Report No.(s): AD-A435249; No Copyright; Avail: CASI; A03, Hardcopy

The DoD Defense Production (DPA) Act Title III program sponsored this project in response to a critical supply base issue with the objective of strengthening the supplier base to ensure it's future viability. Microwave Power Tubes (MPTs) are of critical concern because of their extensive use in military weapon systems and the limited number of suppliers. The products addressed are helix tape, heater filaments, and cathodes. The project team included IIT research Institute (IITRI) and four subtier suppliers: Semicon Associates, Spectra-Mat, Inc. (SMI), H. Cross Co. and Union City Filament Corp. Boeing Electron Dynamic Devices (EDD), Communication and Power Industries (CPI), and Northrop Grumman Electronic Systems, three of the industry's major MPT producers, served as technical advisors. This task sought to resolve not only general, industry-wide issues, but company specific problems as well. The overall benefits and implications to DoD include: Reduced risk to DoD of production shortfalls; a more responsive supply base, especially for meeting military 'surge' requirements; reduced risk of losing the manufacturing process knowledge for these components; lower cost due to simplification of some processes; strategic marketing is enhancing the overall business viability of the four suppliers, especially in recent economic uncertainty; and he adaptation of modern manufacturing engineering tools will position this segment of the supply chain to meet not only the needs of DoD today, but in the future as well. Development of two engineering specifications (EIA-940 and EIA-941) was also a major achievement. Prior to this task, the industry lacked specifications or standards that sufficiently defined performance requirements. A key benefit of standardizing criteria among the MPT producers is cost containment through less material review and scrap. Collectively, thi
DTIC
Industries; Microwave Tubes; Supplying; Viability

20050196612 NASA Glenn Research Center, Cleveland, OH, USA

Training Data Optimized and Conditioned to Learn Characteristic Patterns of Vibrating Blisks and Fan Blades

Decker, Arthur J.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

At the NASA Glenn Research Center, we have been training artificial neural networks to interpret the characteristic patterns (see the leftmost image) generated from electronic holograms of vibrating structures. These patterns not only visualize the vibration properties of structures, but small changes in the patterns can indicate structural changes, cracking, or damage. Neural networks detect these small changes well. Our objective has been to adapt the neural-network, electronic-holography combination for inspecting components in Glenn's Spin Rig.

Derived from text

Vibration; Fan Blades; Damage; Data Acquisition

20050196621 Army Research Lab., Cleveland, OH, USA

Flow Range of Centrifugal Compressor Being Extended

Skoch, Gary J.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

General Aviation will benefit from turbine engines that are both fuel-efficient and reliable. Current engines fall short of their potential to achieve these attributes. The reason is compressor surge, which is a flow stability problem that develops when the compressor is subjected to conditions that are outside of its operating range. Compressor surge can occur when fuel flow to the engine is increased, temporarily back pressuring the compressor and pushing it past its stability limit, or when the compressor is subjected to inlet flow-field distortions that may occur during takeoff and landing. Compressor surge can result in the loss of an aircraft. As a result, engine designers include a margin of safety between the operating line of the engine and the stability limit line of the compressor. Unfortunately, the most efficient operating line for the compressor is usually closer to its stability limit line than it is to the line that provides an adequate margin of safety. A wider stable flow range will permit operation along the most efficient operating line of the compressor, improving the specific fuel consumption of the engine and reducing emissions. The NASA Glenn Research Center is working to extend the stable flow range of the compressor. Significant extension has been achieved in axial compressors by injecting air upstream of the compressor blade rows. Recently, the technique was successfully applied to a 4:1 pressure ratio centrifugal compressor by injecting streams of air into the diffuser. Both steady and controlled unsteady injection were used to inject air through the diffuser shroud surface and extend the range. Future work will evaluate the effect of air injection through the diffuser hub surface and diffuser vanes with the goal of maximizing the range extension while minimizing the amount of injected air that is required.

Author

Centrifugal Compressors; Fuel Flow; General Aviation Aircraft

20050196622 NASA Glenn Research Center, Cleveland, OH, USA

Compressor Stall Recovery Through Tip Injection Assessed

Suder, Ken L.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Aerodynamic stability is a fundamental limit in the compressor design process. The development of robust techniques for increasing stability has several benefits: enabling higher loading and fewer blades, increasing safety throughout a mission, increasing tolerance to stage mismatch during part-speed operation and speed transients, and providing an opportunity to match stages at the compressor maximum efficiency point, thus reducing fuel burn. Mass injection upstream of the tip of a high-speed axial compressor rotor is a stability enhancement approach known to be effective in suppressing stall in tip-critical rotors if the injection is activated before stall occurs. This approach to stall suppression requires that a reliable stall warning system be available. Tests have recently been performed to assess whether steady injection can also be used to recover from fully developed stall. If mass injection is effective in recovering from stall quickly enough to avoid structural damage or loss of engine power, then a stall warning system may not be required. The stall recovery tests were performed on a transonic compressor rotor at its design tip speed of 1475 ft/sec using four injectors evenly spaced around the compressor case upstream of the rotor. The injectors were connected to an external air source. In an actual engine application, the injected air would be supplied with compressor bleed air. The injectors were isolated from the air source by a fast-acting butterfly valve. With the injectors turned off, the compressor was throttled into stall. Air injection was then activated with no change in throttle setting by opening the butterfly valve. The compressor recovered from stall at a fixed throttle setting with the aid of tip injection. The unsteady operating characteristic of the rotor was measured during these tests using high-response pressure sensors located upstream and downstream of the rotor. The figure shows the results, where the unsteady pressure and mass flow are superimposed on the steady operating characteristic. The total injected mass flow was equal to 1.3 percent of the compressor flow. The solid line with no solid squares on it denotes the operating point during the beginning of throttle closure and the initial drop into stall. The gray traces denote the operating point during an additional throttle closure that occurred over the

next 1200 rotor revolutions (4 sec). The dashed line denotes the recovery from stall that occurred during 90 rotor revolutions (0.3 sec) after the injectors were activated with no change in throttle setting. Tip injection not only recovers the compressor from stall, but also restores the compressor to its pre-stall level of pressure rise. In contrast, standard stall recovery schemes such as compressor bleed, stator vane actuation, or engine throttle modulation result in a loss of pressure rise across the compressor, which results in a loss of engine power.
Author
Aerodynamic Stalling; Compressor Rotors; Injection; Tip Vanes; Turbocompressors

20050196624 DYNACS Engineering Co., Inc., USA, NASA Glenn Research Center, Cleveland, OH, USA
Optical Diagnosis of Gas Turbine Combustors Being Conducted
Hicks, Yolanda R.; Locke, Randy J.; Anderson, Robert C.; DeGroot, Wilhelmus A.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Researchers at the NASA Glenn Research Center, in collaboration with industry, are reducing gas turbine engine emissions by studying visually the air-fuel interactions and combustion processes in combustors. This is especially critical for next generation engines that, in order to be more fuel-efficient, operate at higher temperatures and pressures than the current fleet engines. Optically based experiments were conducted in support of the Ultra-Efficient Engine Technology program in Glenn's unique, world-class, advanced subsonic combustion rig (ASCR) facility. The ASCR can supply air and jet fuel at the flow rates, temperatures, and pressures that simulate the conditions expected in the combustors of high-performance, civilian aircraft engines. In addition, this facility is large enough to support true sectors ('pie' slices of a full annular combustor). Sectors enable one to test true shapes rather than rectangular approximations of the actual hardware. Therefore, there is no compromise to actual engine geometry. A schematic drawing of the sector test stand is shown. The test hardware is mounted just upstream of the instrumentation section. The test stand can accommodate hardware up to 0.76-m diameter by 1.2-m long; thus sectors or small full annular combustors can be examined in this facility. Planar (two-dimensional) imaging using laser-induced fluorescence and Mie scattering, chemiluminescence, and video imagery were obtained for a variety of engine cycle conditions. The hardware tested was a double annular sector (two adjacent fuel injectors aligned radially) representing approximately 15 of a full annular combustor. An example of the two-dimensional data obtained for this configuration is also shown. The fluorescence data show the location of fuel and hydroxyl radical (OH) along the centerline of the fuel injectors. The chemiluminescence data show C2 within the total observable volume. The top row of this figure shows images obtained at an engine low-power condition, and the bottom row shows data from a higher power operating point. The data show distinctly the differences in flame structure between low-power and high-power engine conditions, in both location and amount of species produced (OH, C2) or consumed (fuel). The unique capability of the facility coupled with its optical accessibility helps to eliminate the need for high-pressure performance extrapolations. Tests such as described here have been used successfully to assess the performance of fuel-injection concepts and to modify those designs, if needed.
Author (revised)
Combustion Chambers; Gas Turbine Engines; Civil Aviation; Imaging Techniques

20050196666 NASA Glenn Research Center, Cleveland, OH, USA
Unbalance Response Prediction for Accelerating Rotors With Load-Dependent Nonlinear Bearing Stiffness
Fleming, David P.; Sawicki, Jaezy T.; Poplawski, J. V.; June 2005; 15 pp.; In English; Third Biennial International Symposium on Stability Control of Rotating Machinery, 19-23 Sep. 2005, Cleveland, OH, USA
Contract(s)/Grant(s): WBS 22-714-40-10
Report No.(s): NASA/TM-2005-213801; E-15159; No Copyright; Avail: CASI; A03, Hardcopy

Rolling-element bearing forces vary nonlinearly with bearing deflection. Thus an accurate rotordynamic analysis requires that bearing forces corresponding to the actual bearing deflection be utilized. Previous papers have explored the transient effect of suddenly applied imbalance and the steady-state unbalance response, using bearing forces calculated by the rolling-element bearing analysis code COBRA-AHS. The present work considers the acceleration of a rotor through one or more critical speeds. The rotordynamic analysis showed that for rapid acceleration rates the maximum response amplitude may be considerably less than predicted by steady-state analysis. Above the critical speed, transient vibration at the rotor natural frequency occurs, similar to that predicted for a Jeffcott rotor with constant-stiffness bearings. A moderate amount of damping will markedly reduce the vibration amplitude, but this damping is not inherent in ball bearings.
Author
Rotor Dynamics; Balance; Stiffness; Dynamic Response; Roller Bearings

20050196726 NASA Glenn Research Center, Cleveland, OH, USA
The Effect of Ultrapolish on a Transonic Axial Rotor
Roberts, William B.; Thorp, Scott; Prahst, Patricia S.; Strazisar, Anthony; [2005]; 7 pp.; In English; Turbo Expo 2005, 6-9 Jun. 2005, Reno, NV, USA
Contract(s)/Grant(s): 22-714-70-22
Report No.(s): E-15193; Copyright; Avail: CASI; A02, Hardcopy

Back-to-back testing has been done using NASA fan rotor 67 in the Glenn Research Center W8 Axial Compressor Test Facility. The rotor was baseline tested with a normal industrial RMS surface finish of 0.5-0.6 m (20-24 microinches) at 60, 80 and 100% of design speed. At design speed the tip relative Mach number was 1.38. The blades were then removed from the facility and ultrapolished to a surface finish of 0.125 m (5 microinch) or less and retested. At 100% speed near the design point, the ultrapolished blades showed approximately 0.3 - 0.5% increase in adiabatic efficiency. The difference was greater near maximum flow. Due to increased relative measurement error at 60 and 80% speed, the performance difference between the normal and ultrapolished blades was indeterminate at these speeds.
Author
Surface Finishing; Test Facilities; Turbocompressors; Transonic Flow; Polishing; Rotor Blades (Turbomachinery)

20050196759 West Virginia Univ., Morgantown, WV, USA
Selective NOx Recirculation for Stationary Lean-Burn Natural Gas Engines
Clark, N.; Thompson, G.; Atkinson, R.; Tissera, C.; Jan. 2005; 36 pp.; In English
Report No.(s): DE2005-837184; No Copyright; Avail: Department of Energy Information Bridge

The research program conducted at the West Virginia University Engine and Emissions Research Laboratory (EERL) is working towards the verification and optimization of an approach to remove nitric oxides from the exhaust gas of lean burn natural gas engines. This project was sponsored by the US Department of Energy, National Energy Technology Laboratory (NETL) under contract number: DE-FC26-02NT41608. Selective NOx Recirculation (SNR) involves three main steps. First, NOx is adsorbed from the exhaust stream, followed by periodic desorption from the aftertreatment medium. Finally the desorbed NOx is passed back into the intake air stream and fed into the engine, where a percentage of the NOx is decomposed. This reporting period focuses on the NOx decomposition capability in the combustion process. Although researchers have demonstrated NOx reduction with SNR in other contexts, the proposed program is needed to further understand the process as it applies to lean burn natural gas engines. SNR is in support of the Department of Energy goal of enabling future use of environmentally acceptable reciprocating natural gas engines through NOx reduction under 0.1 g/bhp-hr. The study of decomposition of oxides of nitrogen (NOx) during combustion in the cylinder was conducted on a 1993 Cummins L10G 240 hp lean burn natural gas engine. The engine was operated at different air/fuel ratios, and at a speed of 800 rpm to mimic a larger bore engine. A full scale dilution tunnel and analyzers capable of measuring NOx, CO(sub 2), CO, HC concentrations were used to characterize the exhaust gas. Commercially available nitric oxide (NO) was used to mimic the NOx stream from the desorption process through a mass flow controller and an injection nozzle. The same quantity of NOx was injected into the intake and exhaust line of the engine for 20 seconds at various steady state engine operating points. NOx decomposition rates were obtained by averaging the peak values at each set point minus the baseline and finding the ratio between the injected NO amounts. It was observed that the air/fuel ratio, injected NO quantity and engine operating points affected the NOx decomposition rates of the natural gas engine. A highest NOx decomposition rate of 27% was measured from this engine. A separate exploratory tests conducted with a gasoline engine with a low air/fuel ratio yielded results that suggested, that high NOx decomposition rates may be possible if a normally lean burn engine were operated at conditions closer to stoichiometric, with high exhaust gas recirculation (EGR) for a brief period of time during the NOx decomposition phase and with a wider range of air/fuel ratios. Chemical kinetic model predictions using CHEMKIN were performed to relate the experimental data with the established rate and equilibrium models. NOx decomposition rates from 35% to 42% were estimated using the CHEMKIN software. This provided insight on how to maximize NOx decomposition rates for a large bore engine. In the future, the modeling will be used to examine the effect of higher NO(sub 2)/NO ratios that are associated with lower speed and larger bore lean burn operation.
NTIS
Circulation; Combustion Products; Exhaust Emission; Exhaust Gases; Internal Combustion Engines; Natural Gas; Nitrogen Oxides; Nitrous Oxides

20050196812 Army Research Lab., Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Cross-Axis Proportional Gains Used to Control Gyroscopic Effects in a Magnetic- Bearing-Supported Flywheel
Brown, Gerald V.; Kascak, Albert F.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

For magnetic-bearing-supported high-speed machines with significant gyroscopic effects, it is necessary to stabilize both forward and backward tilt whirling modes. Instability or the low damping of these modes can prevent the attainment of desired shaft speeds. Previous work elsewhere showed that cross-axis derivative gain in the magnetic bearing control law can improve the stability of the forward whirl mode, but it is commonly recognized that derivative gains amplify high-frequency noise and increase the required control effort. At the NASA Glenn Research Center, it has been shown previously that a simple cross-axis proportional gain can add stability (without adding noise) to either forward whirl or backward whirl, depending on the sign of the gain, but that such a gain destabilizes the other mode. It has been predicted by Glenn analysis that both modes can be stabilized by cross-axis proportional gains by utilizing the large-frequency separation of the two modes at speeds where the gyroscopic effects are significant. We use a modal controller that decouples the tilt and center-of-mass-translation modes. Only the tilt modes exhibit speed-dependent gyroscopic effects. The key to controlling them by the present method is to stabilize the backward whirl tilt mode with the appropriate sign of cross-axis proportional gain in the control law, but to include a low-pass filter on that gain term to restrict its effect only to the low-frequency backward-whirl mode. A second cross-axis term with the opposite sign and a high-pass filter stabilizes the forward whirl, which can have a frequency one or two orders of magnitude higher than the backward whirl, permitting very independent action of the two terms. Because the physical gyroscopic torques are proportional to the spinning speed of the shaft, it is convenient to gain-schedule the cross-axis control terms by making them proportional to shaft speed. This has the added benefit of avoiding a somewhat awkward zero-speed splitting of the tilt-mode eigenvalues.
Derived from text
Flywheels; Magnetic Bearings; Rotation

20050196814 NASA Glenn Research Center, Cleveland, OH, USA
DC Control Effort Minimized for Magnetic-Bearing-Supported Shaft
Brown, Gerald V.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A magnetic-bearing-supported shaft may have a number of concentricity and alignment problems. One of these involves the relationship of the position sensors, the centerline of the backup bearings, and the magnetic center of the magnetic bearings. For magnetic bearings with permanent magnet biasing, the average control current for a given control axis that is not bearing the shaft weight will be minimized if the shaft is centered, on average over a revolution, at the magnetic center of the bearings. That position may not yield zero sensor output or center the shaft in the backup bearing clearance. The desired shaft position that gives zero average current can be achieved if a simple additional term is added to the control law. Suppose that the instantaneous control currents from each bearing are available from measurements and can be input into the control computer. If each control current is integrated with a very small rate of accumulation and the result is added to the control output, the shaft will gradually move to a position where the control current averages to zero over many revolutions. This will occur regardless of any offsets of the position sensor inputs. At that position, the average control effort is minimized in comparison to other possible locations of the shaft. Nonlinearities of the magnetic bearing are minimized at that location as well.
Derived from text
Magnetic Bearings; Shafts (Machine Elements)

20050196815 NASA Glenn Research Center, Cleveland, OH, USA
Synchronous Control Effort Minimized for Magnetic-Bearing-Supported Shaft
Brown, Gerald V.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Various disturbances that are synchronous with the shaft speed can complicate radial magnetic bearing control. These include position sensor target irregularities (runout) and shaft imbalance. The method presented here allows the controller to ignore all synchronous harmonics of the shaft position input (within the closed-loop bandwidth) and to respond only to asynchronous motions. The result is reduced control effort.
Derived from text
Magnetic Bearings; Shafts (Machine Elements)

20050196816 NASA Glenn Research Center, Cleveland, OH, USA
Fail-Safe Magnetic Bearing Controller Demonstrated Successfully
Choi, Benjamin B.; Provenza, Andrew J.; Research and Technology 2000; March 2001; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Structural Mechanics and Dynamics Branch has successfully demonstrated a fail-safe controller for the Fault-Tolerant Magnetic Bearing rig at the NASA Glenn Research Center. The rotor is supported by two 8-pole redundant radial bearings, and coil failing situations are simulated by manually shutting down their control current commands from the controller cockpit. The effectiveness of the controller was demonstrated when only two active coils from each radial bearing could be used (that is, 14 coils failed). These remaining two coils still levitated the rotor and spun it without losing stability or desired position up to the maximum allowable speed of 20,000 rpm.
Derived from text
Magnetic Bearings; Fail-Safe Systems

20050196820 NASA Langley Research Center, Hampton, VA, USA
Nonlinear Analysis of Bonded Composite Tubular Lap Joints
Oterkus, E.; Madenci, E.; Smeltzer, S. S., III; Ambur, D. R.; [2005]; 43 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA
Contract(s)/Grant(s): 23-064-50-00; Copyright; Avail: CASI; A03, Hardcopy

The present study describes a semi-analytical solution method for predicting the geometrically nonlinear response of a bonded composite tubular single-lap joint subjected to general loading conditions. The transverse shear and normal stresses in the adhesive as well as membrane stress resultants and bending moments in the adherends are determined using this method. The method utilizes the principle of virtual work in conjunction with nonlinear thin-shell theory to model the adherends and a cylindrical shear lag model to represent the kinematics of the thin adhesive layer between the adherends. The kinematic boundary conditions are imposed by employing the Lagrange multiplier method. In the solution procedure, the displacement components for the tubular joint are approximated in terms of non-periodic and periodic B-Spline functions in the longitudinal and circumferential directions, respectively. The approach presented herein represents a rapid-solution alternative to the finite element method. The solution method was validated by comparison against a previously considered tubular single-lap joint. The steep variation of both peeling and shearing stresses near the adhesive edges was successfully captured. The applicability of the present method was also demonstrated by considering tubular bonded lap-joints subjected to pure bending and torsion.
Author
Bonded Joints; Lap Joints; Nonlinearity

20050198849 NASA Glenn Research Center, Cleveland, OH, USA
How to Overcome Numerical Challenges to Modeling Stirling Engines
Dyson, Rodger W.; Wilson, Scott D.; Tew, Roy C.; [2004]; 22 pp.; In English; International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA
Contract(s)/Grant(s): 22-972-30-01
Report No.(s): E-14850; No Copyright; Avail: CASI; A03, Hardcopy

Nuclear thermal to electric power conversion carries the promise of longer duration missions and higher scientific data transmission rates back to Earth for a range of missions, including both Mars rovers and deep space missions. A free-piston Stirling convertor is a candidate technology that is considered an efficient and reliable power conversion device for such purposes. While already very efficient, it is believed that better Stirling engines can be developed if the losses inherent in current designs could be better understood. However, they are difficult to instrument and so efforts are underway to simulate a complete Stirling engine numerically. This has only recently been attempted and a review of the methods leading up to and including such computational analysis is presented. And finally it is proposed that the quality and depth of Stirling loss understanding may be improved by utilizing the higher fidelity and efficiency of recently developed numerical methods. One such method, the Ultra HI-FI technique is presented in detail.
Author
Mathematical Models; Stirling Engines; Spacecraft Power Supplies; Nuclear Electric Power Generation

20050198850 NASA Glenn Research Center, Cleveland, OH, USA
Friction and Wear Characteristics of a Modified Composite Solid Lubricant Plasma Spray Coating
Stanford, M. K.; DellaCorte, C.; [2004]; 5 pp.; In English; International Surface Engineering Congress and Exhibition, 2-4 Aug. 2004, Orlando, FL, USA
Contract(s)/Grant(s): 22-714-09-17
Report No.(s): E-14847; No Copyright; Avail: CASI; A01, Hardcopy

LCR304 is a solid lubricant coating composed of Ni-10Cr, Cr2O3, BaF2-CaF2 and Ag and developed for dimensional

stability in high temperature air. This coating is a modification of PS304, which differs in that the Ni-Cr constituent contains 20wt% Cr. The tribological characteristics of LCR304 were evaluated by pin-on-disk and foil air bearing rig testing from 25 to 650 C and compared to previous test results with PS304. For both tests, the friction coefficient decreased as temperature increased from 25 to 650 C. Wear generally decreased with increasing temperature for all pin-on-disk tests. LCR304 coated components produced the least wear of Inconel X-750 counterface materials at 427 and 650 C. These results indicate that the LCR304 coating has potential as a replacement for PS304 in, for example, low cycle (minimum wear) applications where dimensional stability is imperative.
Author
Dimensional Stability; High Temperature Air; Thermal Control Coatings; Composite Materials; Solid Lubricants; Sprayed Coatings; Wear Tests; High Temperature Tests

20050198899 NASA Glenn Research Center, Cleveland, OH, USA
Gardosian Patterns in Tribology
DellaCorte, Christopher; [2004]; 11 pp.; In English
Contract(s)/Grant(s): WBS 22-714-09-17
Report No.(s): E-14552; No Copyright; Avail: CASI; A03, Hardcopy

The following paper is a memorial retrospective on selected research of Dr. Michael N. Gardos. Dr. Gardos spent his professional career engaged in tribological research which often extended the scientific boundaries of the field. Several of the concepts he put forth into the tribology community were initially met with grave skepticism but over time his views have been largely embraced but not widely acknowledged. His approach to new research topics was often characterized by these qualities: 1) pioneering points of view, 2) the use of the model experiment, and 3) the presence of multiple research agendas for each single experiment. I have chosen to name his research approach as 'Gardosian Patterns' in honor of his contributions to Tribology. Three specific examples of these patterns will be reviewed. One is the concept of atomic level tailoring of materials to control macroscopic properties. A second is the use of a model ball polishing experiment to identify high fracture toughness ceramics for use in rolling element bearings. A third Gardosian Pattern example is his pioneering work with the tribology of diamond and diamond films in which he proposed controlling friction via surface bond tailoring. In these examples, Gardos utilized conventional research tools in unconventional ways and, at times, even developed new tools which have become part of the mainstream. His remarkable career has left a positive and lasting mark on Tribology.
Author
Tribology; Ball Bearings; Friction; Wear; Ceramics; Diamond Films

20050199439 NASA Glenn Research Center, Cleveland, OH, USA
New Gear Transmission Error Measurement System Designed
Oswald, Fred B.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The prime source of vibration and noise in a gear system is the transmission error between the meshing gears. Transmission error is caused by manufacturing inaccuracy, mounting errors, and elastic deflections under load. Gear designers often attempt to compensate for transmission error by modifying gear teeth. This is done traditionally by a rough 'rule of thumb' or more recently under the guidance of an analytical code. In order for a designer to have confidence in a code, the code must be validated through experiment. NASA Glenn Research Center contracted with the Design Unit of the University of Newcastle in England for a system to measure the transmission error of spur and helical test gears in the NASA Gear Noise Rig. The new system measures transmission error optically by means of light beams directed by lenses and prisms through gratings mounted on the gear shafts. The amount of light that passes through both gratings is directly proportional to the transmission error of the gears. A photodetector circuit converts the light to an analog electrical signal. To increase accuracy and reduce 'noise' due to transverse vibration, there are parallel light paths at the top and bottom of the gears. The two signals are subtracted via differential amplifiers in the electronics package. The output of the system is 40 mV/mm, giving a resolution in the time domain of better than 0.1 mm, and discrimination in the frequency domain of better than 0.01 mm. The new system will be used to validate gear analytical codes and to investigate mechanisms that produce vibration and noise in parallel axis gears.
Derived from text
Gears; Errors; Error Analysis; Error Correcting Devices; Optical Measurement; Optoelectronic Devices

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20050194652 Lawrence Livermore National Lab., Livermore, CA USA
Critical Soil-Structure Interaction Analysis Considerations for Seismic Qualification of Safety Equipment
Hossain, Q. A.; Mar. 05, 2004; 10 pp.; In English
Report No.(s): DE2005-15014015; UCRL-CONF-202729; No Copyright; Avail: Department of Energy Information Bridge

In the USA, safety-related equipment in nuclear and hazardous chemical facilities are required to be designed such that the equipment perform their safety function(s) during and following the design basis earthquake (DBE). The input seismic motion to which the safety-related equipment are qualified is determined from a seismic model of the building that often includes an approximate representation of the foundation soil or rock on which the building is located. This model is subjected to the design basis seismic acceleration time-history, and the resulting acceleration responses are calculated at various equipment support locations from which in-structure acceleration response spectra are generated. The equipment is then designed to withstand the motion that corresponds to the in-structure spectra applicable to the equipment location in the building.
NTIS
Buildings; Qualifications; Safety; Soils

20050195874 NASA Glenn Research Center, Cleveland, OH, USA
Probabilistic Study Conducted on Sensor-Based Engine Life Calculation
Guo, Ten-Huei; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Turbine engine life management is a very complicated process to ensure the safe operation of an engine subjected to complex usage. The challenge of life management is to find a reasonable compromise between the safe operation and the maximum usage of critical parts to reduce maintenance costs. The commonly used 'cycle count' approach does not take the engine operation conditions into account, and it oversimplifies the calculation of the life usage. Because of the shortcomings, many engine components are regularly pulled for maintenance before their usable life is over. And, if an engine has been running regularly under more severe conditions, components might not be taken out of service before they exceed their designed risk of failure. The NASA Glenn Research Center and its industrial and academic partners have been using measurable parameters to improve engine life estimation. This study was based on the Monte Carlo simulation of 5000 typical flights under various operating conditions. First a closed-loop engine model was developed to simulate the engine operation across the mission profile and a thermomechanical fatigue (TMF) damage model was used to calculate the actual damage during takeoff, where the maximum TMF accumulates. Next, a Weibull distribution was used to estimate the implied probability of failure for a given accumulated cycle count. Monte Carlo simulations were then employed to find the profiles of the TMF damage under different operating assumptions including parameter uncertainties. Finally, probabilities of failure for different operating conditions were analyzed to demonstrate the importance of a sensor-based damage calculation in order to better manage the risk of failure and on-wing life.
Author
Probability Theory; Life (Durability); Turbine Engines; Aircraft Engines; Failure Analysis

20050196653 NASA Langley Research Center, Hampton, VA, USA
Comparison of Response Surface Construction Methods for Derivative Estimation Using Moving Least Squares, Kriging and Radial Basis Functions
Krishnamurthy, Thiagarajan; [2005]; 28 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA; Original contains color illustrations
Contract(s)/Grant(s): 23-064-30-25
Report No.(s): AIAA Paper 2005-1821; No Copyright; Avail: CASI; A03, Hardcopy

Response construction methods using Moving Least Squares (MLS), Kriging and Radial Basis Functions (RBF) are compared with the Global Least Squares (GLS) method in three numerical examples for derivative generation capability. Also, a new Interpolating Moving Least Squares (IMLS) method adopted from the meshless method is presented. It is found that the response surface construction methods using the Kriging and RBF interpolation yields more accurate results compared

with MLS and GLS methods. Several computational aspects of the response surface construction methods also discussed.
Derived from text
Least Squares Method; Derivation; Kriging

20050196733 NASA Glenn Research Center, Cleveland, OH, USA, Cleveland State Univ., Cleveland, OH, USA, Texas Univ., TX, USA
Nondestructive Evaluation Methodologies Developed for Certifying Composite Flywheels
Baaklini, George Y.; Konno, Kevin E.; Martin, Richard E.; Thompson, Richard; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Manufacturing readiness of composite rotors and certification of flywheels depend in part on the maturity of nondestructive evaluation (NDE) technology for process optimization and quality assurance, respectively. At the NASA Glenn Research Center, the capabilities and limitations of x-ray-computed tomography and radiography, as well as advanced ultrasonics were established on NDE ring and rotor standards with electrical discharge machining (EDM) notches and drilled holes. Also, intentionally seeded delamination, tow break, and insert of bagging material were introduced in hydroburst-rings to study the NDE detection capabilities of such anomalies and their effect on the damage tolerance and safe life margins of subscale rings and rotors. Examples of possible occurring flaws or anomalies in composite rings as detected by NDE and validated by destructive metallography are shown. The general NDE approach to ensure the quality of composite rotors and to help in the certification of flywheels is briefly outlined.
Derived from text
Nondestructive Tests; Flywheels; Certification; Quality Control

20050198845 Cleveland State Univ., Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Nondestructive Evaluation Approaches Developed for Material Characterization in Aeronautics and Space Applications
Baaklini, George Y.; Kautz, Harold E.; Gyekenyesi, Andrew L.; Abdul-Aziz, Ali; Martin, Richard E.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

At the NASA Glenn Research Center, nondestructive evaluation (NDE) approaches were developed or tailored for characterizing advanced material systems. The emphasis was on high-temperature aerospace propulsion applications. The material systems included monolithic ceramics, superalloys, and high-temperature composites. In the aeronautics area, the major applications were cooled ceramic plate structures for turbine applications, gamma-TiAl blade materials for low-pressure turbines, thermoelastic stress analysis for residual stress measurements in titanium-based and nickel-based engine materials, and acousto-ultrasonics for creep damage assessment in nickel-based alloys. In the space area, applications consisted of cooled carbon-carbon composites for gas generator combustors and flywheel rotors composed of carbon-fiber-reinforced polymer matrix composites for energy storage on the International Space Station.
Derived from text
Nondestructive Tests; Characterization; Aerospace Systems; Evaluation; Aircraft Construction Materials; Spacecraft Construction Materials; Materials Selection

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STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20050195827 NASA Lewis Research Center, Cleveland, OH, USA
NASA Has Joined America True's Design Mission for 2000
Steele, Gynelle C.; Research and Technology 1998; April 1999; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Engineers at the NASA Lewis Research Center will support the America True design team led by America s Cup innovator Phil Kaiko. The joint effort between NASA and America True is encouraged by Mission HOME, the official public awareness campaign of the U.S. space community. NASA Lewis and America True have entered into a Space Act Agreement to focus on the interaction between the airfoil and the large deformation of the pretensioned sails and rigs along with the dynamic motions related to the boat motions. This work will require a coupled fluid and structural simulation. Included in the

simulation will be both a steadystate capability, to capture the quasi-state interactions between the air loads and sail geometry and the lift and drag on the boat, and a transient capability, to capture the sail/mast pumping effects resulting from hull motions.
Derived from text
Sails; Boats; Design Optimization; Fluid Mechanics; Structural Design Criteria; Dynamic Structural Analysis; Aerospace Technology Transfer

20050195832 Army Research Lab., Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Experimental and Analytical Determinations of Spiral Bevel Gear-Tooth Bending Stress Compared
Handschuh, Robert F.; Research and Technology 1999; March 2000; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Spiral bevel gears are currently used in all main-rotor drive systems for rotorcraft produced in the USA. Applications such as these need spiral bevel gears to turn the corner from the horizontal gas turbine engine to the vertical rotor shaft. These gears must typically operate at extremely high rotational speeds and carry high power levels. With these difficult operating conditions, an improved analytical capability is paramount to increasing aircraft safety and reliability. Also, literature on the analysis and testing of spiral bevel gears has been very sparse in comparison to that for parallel axis gears. This is due to the complex geometry of this type of gear and to the specialized test equipment necessary to test these components. To develop an analytical model of spiral bevel gears, researchers use differential geometry methods to model the manufacturing kinematics. A three-dimensional spiral bevel gear modeling method was developed that uses finite elements for the structural analysis. This method was used to analyze the three-dimensional contact pattern between the test pinion and gear used in the Spiral Bevel Gear Test Facility at the NASA Glenn Research Center at Lewis Field. Results of this analysis are illustrated in the preceding figure. The development of the analytical method was a joint endeavor between NASA Glenn, the U.S. Army Research Laboratory, and the University of North Dakota.
Author
Gear Teeth; Bending Fatigue; Spiral Bevel Gears; Helicopter Propeller Drive; Kinematics

20050196080 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Developing Ground Snow Loads for New Hampshire
Tobiasson, Wayne; Buska, James; Greatorex, Alan; Tirey, Jeff; Fisher, Joel; Johnson, Steve; Jan. 2000; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434930; No Copyright; Avail: Defense Technical Information Center (DTIC)

Because of New Hampshire's hilly landscape, mapped values of ground snow load are not available for much of its area. We conducted snow load case studies to establish ground snow loads for a specific elevation in each of the 140 towns where no values are currently available. That work was done by three researchers and three structural engineers practicing in New Hampshire. While our methods of analysis varied somewhat, our results were comparable and the feedback we received from each other was quite valuable. We then established an elevation correction factor to transfer our snow load answers to other elevations in each town. We did not do case studies for the 102 towns in New Hampshire where mapped values are available. We are now planning to do that, as we believe that case studies improve snow load design criteria. We suggest that similar studies be conducted for other places in the USA.
DTIC
Loads (Forces); Snow

20050196221 Industrial Coll. of the Armed Forces, Washington, DC USA
A Report on the Industry: Construction
Conway, Hugh; Dunn, Colin; Khalil, Gary; Jun. 2004; 43 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435136; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper captures a comprehensive 5-month study of the construction industry. It seeks to define the industry and identifies current conditions and industry trends. It reviews several challenges confronting the industry and examines the role of government in shaping its future and overcoming these obstacles. Three essays provide a deeper examination of several issues relevant to the industry today. The highly competitive construction industry is a powerful engine for the U.S. economy, providing strength and stability to the U. S. national Gross Domestic Product (GDP). A healthy construction industry creates jobs, fuels the economy, enhances the quality of life for Americans, and is an essential component of national security. In 2003, construction continued to track its performance as a generally healthy and moderately profitable industry. The construction

industry grew at a moderate pace in the last year despite a weakening economy and chronic shortages of skilled and semi-skilled labor. The economic stimulus package, a rebounding economy, and continued low interest rates fueled unprecedented increases in housing construction and helped stimulate modest commercial construction. Value in the industry remains strong with projections for limited growth prospects domestically and potentially significant opportunities in the international sector. Industry data shows evidence of a continuing trend toward consolidation through acquisitions and mergers, forcing smaller construction-related companies to increase their productivity to remain competitive. This trend is driving an accelerated use of information technology tools to improve efficiency. As state and local governments find it increasingly difficult to raise revenues to build and maintain needed infrastructure, alternative financing mechanisms involving private financing of public infrastructure are becoming more widespread.
DTIC
Construction; Economics; Forecasting; Industries; Policies; Security; United States

20050196234 Army Combined Arms Center, Fort Leavenworth, KS USA
Diehard Buildings. Control Architecture -a Challenge for the Urban Warrior
Oct. 2003; 10 pp.; In English
Report No.(s): AD-A435159; No Copyright; Avail: Defense Technical Information Center (DTIC)
Where security is a primary concern, city planners seek to protect residents and high-value property from the city's more aggressive residents. Architects join planners in developing subtle ways to control public access to affluent residential areas, government buildings, banks, major firms, key industrial sites, and such buildings as presidential palaces. While the control aspect of urban design mainly interests architects, city planners, public safety officials, and military professionals, should be aware of such control aspects. For example, a country's military force might have to back up police and firefighters or capture a structure hardened by new technology. Military efforts to recapture important urban buildings are often spectacular. Examples are the 1980 British Special Air Service assault on the Iranian Embassy in London; the 1985 Colombian military assault on the Palace of Justice in Bogota; and the 1997 Peruvian military assault on the Japanese Ambassador's residence in Lima. Since then, many key buildings have been hardened and incorporate new control architecture. Hardened buildings present challenges to the military attacker, especially when attackers must limit collateral damage. Control architecture is the reasonably unobtrusive use of terrain, landscaping, structures, design, and technology to limit access, guide movement, thin and contain groups, or prevent entry to high-value buildings, urban centers, industrial sites, and affluent residential areas. While often appearing to improve access to an area, control architecture actually allows a small security element to control or deny access. Urban operations are difficult, and armed action against city buildings severely tasks even well trained, well-equipped units. Assaulting modern buildings that incorporate control architecture increases the commander's challenge and demands thorough planning, detailed intelligence, specific ROE, special equipment, and multiple mission rehearsals.
DTIC
Access Control; Buildings; Security

20050196627 NASA Langley Research Center, Hampton, VA, USA
Multiscale Modeling for the Analysis for Grain-Scale Fracture Within Aluminum Microstructures
Glaessgen, Edward H.; Phillips, Dawn R.; Yamakov, Vesselin; Saether, Erik; [2005]; 9 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS1-00135; NCC1-02043; 23-064-20-32
Report No.(s): AIAA Paper 2005-1851; No Copyright; Avail: CASI; A02, Hardcopy
Multiscale modeling methods for the analysis of metallic microstructures are discussed. Both molecular dynamics and the finite element method are used to analyze crack propagation and stress distribution in a nanoscale aluminum bicrystal model subjected to hydrostatic loading. Quantitative similarity is observed between the results from the two very different analysis methods. A bilinear traction-displacement relationship that may be embedded into cohesive zone finite elements is extracted from the nanoscale molecular dynamics results.
Author
Aluminum; Microstructure; Molecular Dynamics; Grains; Mathematical Models; Fracture Mechanics

20050198847 NASA Glenn Research Center, Cleveland, OH, USA
Micromechanics-Based Inelastic Finite Element Analysis Accomplished Via Seamless Integration of MAC/GMC
Arnold, Steven M.; Trowbridge, D.; Research and Technology 2000; March 2001; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A critical issue in the micromechanics-based analysis of composite structures becomes the availability of a computationally efficient homogenization technique: one that is 1) Capable of handling the sophisticated, physically based, viscoelastoplastic constitutive and life models for each constituent; 2) Able to generate accurate displacement and stress fields at both the macro and the micro levels; 3) Compatible with the finite element method. The Generalized Method of Cells (GMC) developed by Paley and Aboudi is one such micromechanical model that has been shown to predict accurately the overall macro behavior of various types of composites given the required constituent properties. Specifically, the method provides 'closed-form' expressions for the macroscopic composite response in terms of the properties, size, shape, distribution, and response of the individual constituents or phases that make up the material. Furthermore, expressions relating the internal stress and strain fields in the individual constituents in terms of the macroscopically applied stresses and strains are available through strain or stress concentration matrices. These expressions make possible the investigation of failure processes at the microscopic level at each step of an applied load history.
Derived from text
Composite Structures; Finite Element Method; Micromechanics; Structural Analysis

20050198848 NASA Glenn Research Center, Cleveland, OH, USA
General Multimechanism Reversible-Irreversible Time-Dependent Constitutive Deformation Model Being Developed
Saleeb, A. F.; Arnold, Steven M.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Since most advanced material systems (for example metallic-, polymer-, and ceramic-based systems) being currently researched and evaluated are for high-temperature airframe and propulsion system applications, the required constitutive models must account for both reversible and irreversible time-dependent deformations. Furthermore, since an integral part of continuum-based computational methodologies (be they microscale- or macroscale-based) is an accurate and computationally efficient constitutive model to describe the deformation behavior of the materials of interest, extensive research efforts have been made over the years on the phenomenological representations of constitutive material behavior in the inelastic analysis of structures. From a more recent and comprehensive perspective, the NASA Glenn Research Center in conjunction with the University of Akron has emphasized concurrently addressing three important and related areas: that is, 1) Mathematical formulation; 2) Algorithmic developments for updating (integrating) the external (e.g., stress) and internal state variables; 3) Parameter estimation for characterizing the model. This concurrent perspective to constitutive modeling has enabled the overcoming of the two major obstacles to fully utilizing these sophisticated time-dependent (hereditary) constitutive models in practical engineering analysis. These obstacles are: 1) Lack of efficient and robust integration algorithms; 2) Difficulties associated with characterizing the large number of required material parameters, particularly when many of these parameters lack obvious or direct physical interpretations.
Derived from text
Time Dependence; Deformation; Mathematical Models; Phenomenology

20050198887 NASA Langley Research Center, Hampton, VA, USA
Buckling and Failure of Compression-loaded Composite Cylindrical Shells with Reinforced Cutouts
Hilburger, Mark W.; Nemeth, Michael P.; [2005]; 24 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA
Contract(s)/Grant(s): 23-376-70-30
Report No.(s): AIAA Paper 2005-2370; No Copyright; Avail: CASI; A03, Hardcopy

Results from a numerical and experimental study that illustrate the effects of selected cutout reinforcement configurations on the buckling and failure response of compression-loaded composite cylindrical shells with a cutout are presented. The effects of reinforcement size, thickness, and orthotropy on the overall response of compression-loaded shells are described. In general, reinforcement around a cutout in a compression-loaded shell can retard or eliminate the local buckling response and material failure near the cutout and increase the buckling load of the shell. However, some results show that certain reinforcement configurations can cause a significant increase in the local interlaminar failures that can accumulate near the free edges of a cutout during a local buckling event.
Author
Cylindrical Shells; Buckling; Structural Analysis

20050198895 NASA Langley Research Center, Hampton, VA, USA
Orbiter LH2 Feedline Flowliner Cracking Problem
Harris, Charles E.; Cragg, Clinton H.; Raju, Ivatury S.; Elliot, Kenny B.; Madaras, Eric I.; Piascik, Robert S.; Halford, Gary R.; Bonacuse, Peter J.; Sutliff, Daniel L.; Bakhle, Milind A., et al.; July 2005; 137 pp.; In English
Contract(s)/Grant(s): WU 104-08-41
Report No.(s): NASA/TM-2005-213787/Version-1.0; L-19148/Version-1.0; NESC-RP-04-11/04-004-E/Version-1.0; No Copyright; Avail: CASI; A07, Hardcopy

In May of 2002, three cracks were found in the downstream flowliner at the gimbal joint in the LH2 feedline at the interface with the Low Pressure Fuel Turbopump (LPFP) of Space Shuttle Main Engine (SSME) #1 of Orbiter OV-104. Subsequent inspections of the feedline flowliners in the other orbiters revealed the existence of 8 additional cracks. No cracks were found in the LO2 feedline flowliners. A solution to the cracking problem was developed and implemented on all orbiters. The solution included weld repair of all detectable cracks and the polishing of all slot edges to remove manufacturing discrepancies that could initiate new cracks. Using the results of a fracture mechanics analysis with a scatter factor of 4 on the predicted fatigue life, the orbiters were cleared for return to flight with a one-flight rationale requiring inspections after each flight. OV-104 flew mission STS-112 and OV-105 flew mission STS-113. The post-flight inspections did not find any cracks in the repaired flowliners. At the request of the Orbiter Program, the NESC conducted an assessment of the Orbiter LH2 Feedline Flowliner cracking problem with a team of subject matter experts from throughout NASA.
Author
Cracks; Feed Systems; Fatigue Life; Fracture Mechanics; Low Pressure

20050198939 NASA Glenn Research Center, Cleveland, OH, USA
Mechanism of Pinhole Formation in Membrane Electrode Assemblies for PEM Fuel Cells
Stanic, Vesna; Hoberecht, Mark; [2004]; 12 pp.; In English; Electrochemistry Society Conference, 3-8 Oct. 2004, Honolulu, HI, USA
Contract(s)/Grant(s): NAS3-02203; NAS3-02093; WBS 22-794-40-51
Report No.(s): E-114868; No Copyright; Avail: CASI; A03, Hardcopy

The pinhole formation mechanism was studied with a variety of MEAs using ex-situ and in-situ methods. The ex-situ tests included the MEA aging in oxygen and MEA heat of ignition. In-situ durability tests were performed in fuel cells at different operating conditions with hydrogen and oxygen. After the in-situ failure, MEAs were analyzed with an Olympus BX 60 optical microscope and Cambridge 120 scanning electron microscope. MEA chemical analysis was performed with an IXRF EDS microanalysis system. The MEA failure analyses showed that pinholes and tears were the MEA failure modes. The pinholes appeared in MEA areas where the membrane thickness was drastically reduced. Their location coincided with the stress concentration points, indicating that membrane creep was responsible for their formation. Some of the pinholes detected had contaminant particles precipitated within the membrane. This mechanism of pinhole formation was correlated to the polymer blistering.
Author
Fuel Cells; Pinholes; Membranes; Microstructure; Failure Analysis

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20050192515 Geoscience Australia, Canberra, Australia
Geoscience Australia RNAAC
Luton, Geoffrey; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 283-284; In English; See also 20050192500; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The RNAAC function of routinely processing all stations in the Australian Regional GPS Network (ARGN) continued during 2001. The weekly combined SINEX result files were submitted to the Crustal Dynamics Data Information System (CDDIS). The Australian Surveying and Land Information Group (AUSLIG) was merged with the Australian Geological

Survey Organization (AGSO) in September 2001 to form Geoscience Australia (GA).
Derived from text
Australia; Geophysics; Information Systems; Geological Surveys

43
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20050192562 Georgia Inst. of Tech., Atlanta, GA, USA, Georgia Inst. of Tech., Atlanta, GA, USA
Improving the Representation of Land in Climate Models by Application of EOS Observations
March 31, 2004; 11 pp.; In English
Contract(s)/Grant(s): NAG5-10209
Report No.(s): G-35-674; No Copyright; Avail: CASI; A03, Hardcopy

The PI's IDS current and previous investigation has focused on the applications of the land data toward the improvement of climate models. The previous IDS research identified the key factors limiting the accuracy of climate models to be the representation of albedos, land cover, fraction of landscape covered by vegetation, roughness lengths, surface skin temperature and canopy properties such as leaf area index (LAI) and average stomatal conductance. Therefore, we assembled a team uniquely situated to focus on these key variables and incorporate the remotely sensed measures of these variables into the next generation of climate models.
Derived from text
Climate Models; Remote Sensing; Land; Earth Observing System (EOS)

20050196257 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Modeling Groundwater Flow and Contaminant Transport in Fractured Aquifers
Bordas, Jason M.; Mar. 2005; 119 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435202; AFIT/GEM/ENV/05M-02; No Copyright; Avail: Defense Technical Information Center (DTIC)

The hybrid discrete fracture network/equivalent porous medium (DFN/EPM) model was selected for analysis and application to simulate a contaminated site in this study. The DFN/EPM was selected because it appeared to have the potential to aid decision making by remedial project managers at contaminated DoD fractured aquifer sites. This model can use data that are typically available at a site while incorporating the important processes relevant to describing contaminant transport in a fractured medium. The model was applied to simulate the operation of a pump-and-treat remedial action at a trichloroethene-contaminated fractured aquifer at Pease AFB. The model was able to simulate the salient characteristics of hydraulic and contaminant data collected at the site during operation of the remediation pump-and-treat system. The model was then used to evaluate the impact of various pump-and-treat system designs on contaminant containment at the site. Based on these model simulations, the potential benefits to site managers of using the DFN/EPM approach to model groundwater flow and contaminant transport at fractured aquifer sites were demonstrated.
DTIC
Aquifers; Contaminants; Fracturing; Ground Water; Models; Porosity; Water Flow

20050196259 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Analysis of Online-Delaunay Navigation for Time-Sensitive Targeting
Chow, David; Mar. 2005; 78 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435205; AFIT/GOR/ENS/05-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

Given the drawbacks of leaving time-sensitive targeting (TST) strictly to humans, there is value to the investigation of alternative approaches to TST operations that employ autonomous systems. This paper accomplishes five things. First, it proposes a short-hop abbreviated routing paradigm (SHARP) - based on Delaunay triangulations (DT), ad-hoc communication, and autonomous control - for recognizing and engaging TSTs that, in theory, will improve upon persistence, the volume of influence, autonomy, range, and situational awareness. Second, it analyzes the minimum timeframe need by a strike (weapons enabled) aircraft to navigate to the location of a TST under SHARP. Third, it shows the distribution of the transmission radius required to communicate between an arbitrary sender and receiver. Fourth, it analyzes the extent to which connectivity, among nodes with constant communication range, decreases as the number of nodes decreases. Fifth, it shows

the how SHARP reduces the amount of energy required to communicate between two nodes. Mathematica 5.0.1.0 is used to generate data for all metrics. JMP 5.0.1.2 is used to analyze the statistical nature of Mathematica's output.
DTIC
Navigation; Sensitivity; Situational Awareness; Targets; Telecommunication; Triangulation

20050196277 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Determination of Structure from Motion Using Aerial Imagery
Graham, Paul R.; Mar. 2005; 61 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435254; AFIT/GCS/ENG/05-06; No Copyright; Avail: Defense Technical Information Center (DTIC)

The structure from motion process creates three-dimensional models from a sequence of images. Until recently, most research in this field has been restricted to land-based imagery. This research examines the current methods of land-based structure from motion and evaluates their performance for aerial imagery. Current structure from motion algorithms search the initial image for features to track though the subsequent images. These features are used to create point correspondences between the two images. The correspondences are used to estimate the motion of the camera and then the three-dimensional structure of the scene. This research tests current algorithms using synthetic data for correctness and to characterize the motions necessary to produce accurate models. Two approaches are investigated: full Euclidean reconstructions, where the camera motion is estimated using the correspondences, and navigation-aided Euclidean reconstructions, where the camera motion is calculated using the Global Positioning System and inertial navigation system data from the aircraft. Both sets algorithms are applied to images collected from an airborne blimp. It is found that full Euclidean reconstructions have two orders of magnitude more error than navigation-aided Euclidean reconstructions when using typical images from airborne cameras.
DTIC
Aerial Photography; Computer Vision; Image Processing; Images

20050196657 Colorado Univ., Boulder, CO, USA
Retrieval and Validation of Cirrus Cloud Properties with the Far-Infrared Sensor for Cirrus (FIRSC) During CRYSTAL-FACE
Evans, K. Franklin; [2004]; 15 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-11501; No Copyright; Avail: CASI; A03, Hardcopy

This grant supported the principal investigator's analysis of data obtained during CRYSTAL-FACE by two submillimeter-wave radiometers: the Far-Infrared Sensor for Cirrus (FIRSC) and the Conical Scanning Submillimeter-wave Imaging Radiometer (CoSSIR). The PI led the overall FIRSC investigation, though Co-I Michael Vanek led the instrument component at NASA Langley. The overall CoSSIR investigation was led by James Wang at NASA Goddard, but the cirrus retrieval and validation was performed at the University of Colorado. The goal of this research was to demonstrate the submillimeter-wave cirrus cloud remote sensing technique, provide retrievals of ice water path (IWP) and median mass particle diameter (D(sub me)), and perform validation of the cirrus retrievals using other CRYSTAL-FACE datasets.
Author
Cirrus Clouds; Remote Sensing; Far Infrared Radiation; Sensors; Tropical Regions

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

20050188650 Massachusetts Univ., North Dartmouth, MA USA
Catalysis, Architecture and the Electrochemical Performance of Microfibrous Cathodes for Hydrogen Peroxide Based Fuel Cells
Bessette, Russell R.; Patrissi, Charles J.; Medeiros, Maria G.; Carreiro, Louis G.; Kim, Yong K.; Tucker, Steven P.; Deschenes, Craig M.; LaFratta, Christopher N.; Dunnell, Michelle M.; Atwater, Delmas W.; Dec. 2004; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-1-0424; Proj-04PR07198-00
Report No.(s): AD-A434290; No Copyright; Avail: CASI; A03, Hardcopy

A novel cathode morphology has been developed for use in magnesium-hydrogen peroxide semi-fuel cells. A direct electrostatic flocking method is used to prepare the carbon microfiber arrays that are subsequently catalyzed with a Pd/ Ir alloy by electrochemical deposition. The microfibers protrude from a current collector like the bristles of a brush. Flocking under different voltage field strengths and in various atmospheres is reported upon. A pulse potential deposition technique is compared to the baseline cyclic potential method. XRD data represented to conclude that a homogenous alloy of Pd and Ir is obtained by both techniques. Polarization and constant current results sow these electrodes significantly improve the rate capability of the Mg-hydrogen peroxide cell. Individual electrode potential measurements show that most of the polarization occurs on the cathode. Combinations of Co, W, and Mo with Pd and Ir have been studied to improve catalytic activity. Bipolar electrode fabrication has been accomplished. Long term performance data of single cells and two cell stacks are presented Electrode performance modeling was undertaken.
DTIC
Catalysis; Cathodes; Electrodeposition; Fuel Cells; Hydrogen Peroxide; Microfibers

20050188702 Applied Research Associates, Inc., Tyndall AFB, FL USA
Detonation Blast Pressures of TNT and C4 at -100 degrees C
Hawk, John R.; Wander, Joseph D.; Dinan, Robert J.; Trawinski, Elizabeth; Jun. 2004; 18 pp.; In English
Contract(s)/Grant(s): F08637-03-C-6006; Proj-OAFT
Report No.(s): AD-A434361; AFRL-ML-TY-TR-2005-4553; No Copyright; Avail: CASI; A03, Hardcopy

One-lb charges of TNT and C4 were detonated at core temperatures of 30 deg C and -100 deg C, and incident pressure and impulse were compared to determine the effect of cooling on energy release from detonation of the explosive materials. LN2 was used to cool 1-lb (0.45-kg) charges inside two concentric, insulated containers before detonation. Pressure measurements were taken along orthogonal axes 4, 6, 10 and 20 ft from the blast origin. There were no significant statistical differences in incident pressures between shots at ambient temperature and at -100 deg C, but incident impulse decreased an average of 9.5% for both TNT and C4 at -100 deg C. The effect on incident impulse decreased with distance from the blast origin, and was too small to mitigate structural damage and injury to personnel. In principle, greater decrease is to be expected at LN2 or liquid helium temperatures, but these will likely be impractical to use in EOD applications.
DTIC
Ammunition; Detonation

20050188721 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Evaluation of Wind Turbine Technology at Peterson Air Force Base
Combs, Randy C.; Mar. 2005; 140 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434397; AFIT/GCA/ENV/05M-02; No Copyright; Avail: CASI; A07, Hardcopy

Wind energy technology is a viable source for attaining the emission reduction and renewable energy use goals set forth by the executive office. In accordance with Executive Orders, the Air Force must reduce greenhouse emissions and energy consumption, and expand the use of renewable energy sources within its facilities nation-wide by year 2010. This mandate requires that the Air Force look at alternative electrical production and rely more on such renewable energy resources as wind power. The specific problem addressed by this research is whether on-site wind energy generation can be more economically feasible than the conventional energy consumption at Peterson AFB. The hypothesis of this research is that wind energy will not be economically effective as an energy alternative without the inclusion of quantified environmental benefits. The life cycle cost comparisons derived from generating on-site wind energy proved not to be strictly economically feasible for Peterson AFB when compared to fossil fuel generated electricity. However, with the inclusion of the valuation of environmental benefits, it was determined that wind energy is a worthwhile project if the U.S. Air Force is willing to pay the extra costs for the global socioeconomic benefits.
DTIC
Energy Consumption; Environmental Surveys; Greenhouse Effect; Wind (Meteorology); Wind Turbines

20050188759 Princeton Univ., NJ USA
Plasma and MHD Control of Oblique Shocks
Macheret, Sergey O.; Shneider, Mickhail N.; Zaidi, Sohail H.; Miles, Richard B.; Van Wie, David M.; Oct. 2003; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434494; No Copyright; Avail: Defense Technical Information Center (DTIC)

The paper reviews recent studies of supersonic/hypersonic flow and shock wave control using plasma energy addition and

magnetohydrodynamics (MHD), focusing on the work by the Princeton University group and their collaborators. Applications include sonic boom mitigation and optimization of scramjet inlets. Experimental and computational studies of interaction of oblique shocks with laser-generated blast wave and thermal wake demonstrate the possibility of shock mitigation in a repetitive-pulse mode. Analysis of interaction parameter for MHD control of cold hypersonic flows with external ionization shows that significant interaction can be achieved with energy-efficient ionization by electron beams. The maximum achievable interaction parameter sharply increases with increasing Mach number and altitude; however, interelectrode arcing may limit the performance. For MHD control of scramjet inlets, nonequilibrium electrical conductivity is created by electron beams injected into the gas along magnetic field lines. At Mach numbers higher than the design value, the shocks that would otherwise enter the inlet can be moved back to the cowl lip by a short MHD generator at the first compression ramp. To increase air capture at Mach numbers below the design value, a heated region is used to create a'virtual cowl' and to deflect flow streamlines into the inlet. The best location of the energy addition region is near the intersection of the nose shock of the vehicle with the continuation of the cowl line, and slightly below that line. Stretching and tilting the energy addition region improves performance. By spending only a few percent of the enthalpy flux into the inlet, the air capture and engine thrust can be increased by 15-20%, with no loss in specific impulse.
DTIC
Hypersonic Flow; Magnetohydrodynamic Generators; Magnetohydrodynamics; Plasma Control; Supersonic Flow

20050195879 NASA Glenn Research Center, Cleveland, OH, USA
Lightweight Radiators Being Developed or Advanced Stirling Radioisotope Power Systems
Juhasz, Albert J.; Tew, Roy C.; Thieme, Lanny G.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The thermodynamic heat-to-electric power conversion efficiency of Stirling systems is 3 to 5 times higher than that of thermoelectric converters. Hence for unmanned deep space probes, Stirling advanced radioisotope power systems (ARPS) could deliver up to 5 times as much power as radioisotope thermoelectric generators for the same amount of radioisotope, or they could require one-third to one-fifth as much isotope inventory for the same power output. However, Stirling power systems reject unconverted heat at much lower temperatures than radioisotope thermoelectric generators. Normally, this requires larger and heavier heat-rejection subsystems because of the greater radiator areas, which are proportional to the first power of the heat rejected and the fourth power of the absolute heat-rejection temperature, as specified by the Stefan-Boltzmann radiation heat transfer law. The development of directly coupled disk radiators using very high conductivity encapsulated thermopyrolitic graphite materials represents a significant advance in Stirling ARPS space heat-rejection subsystem technology. A conceptual Stirling ARPS with two engines coupled to a radioisotope general-purpose heat source (GPHS) is shown in the illustration.
Derived from text
Electric Generators; Heat Sources; Radiative Heat Transfer; Radioisotope Heat Sources; Thermoelectric Generators

20050195881 NASA Glenn Research Center, Cleveland, OH, USA
Flywheel Energy Storage Technology Being Developed
Wolff, Frederick J.; Research and technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

A flywheel energy storage system was spun to 60,000 rpm while levitated on magnetic bearings. This system is being developed as an energy-efficient replacement for chemical battery systems. Used in groups, the flywheels can have two functions providing attitude control for a spacecraft in orbit as well as providing energy storage. The first application for which the NASA Glenn Research Center is developing the flywheel is the International Space Station, where a two-flywheel system will replace one of the nickel-hydrogen battery strings in the space station's power system. The 60,000-rpm development rotor is about one-eighth the size that will be needed for the space station (0.395 versus 3.07 kWhr).
Derived from text
Flywheels; Energy Storage; Electric Batteries; Attitude Control

20050195988 Motorsoft, Inc., Lebanon, OH USA
Scholarly Research Program Delivery Order 0011: Concept Design for a 1 MW Generator Based on a Permanent Magnet Rotor (Turbine Driven)
Hendershot, James R.; Klontz, Keith; Jan. 2005; 47 pp.; In English
Contract(s)/Grant(s): F33615-98-D-2867-0011; Proj-3145
Report No.(s): AD-A434783; AFRL-PR-WP-TM-2005-2088; No Copyright; Avail: Defense Technical Information Center (DTIC)

The final report documents a conceptual design for a generator capable of generating 1 MW electrical output at 200 VDC with a shaft speed of 15,000 rpm and a maximum outer diameter of 15 inches. It is based on an interior permanent magnet rotor configuration with three phase output. The designs were developed and analyzed using the PC-BDC software which is part of the SPEED (Scottish Power Electronics and Electric Drives consortium) motor/generator analysis suite. Results indicate that the 1 MW generator would have an active magnetic weight of 158-300 lbms which would translate into a total machine weight of approximately 250 - 450 lbms. Thermal management of the designs was not analyzed in detail due to the limited scope of the project. This effort was performed under a delivery order contract to Motorsoft; Universal Energy Systems was the contractor.
DTIC
Electric Generators; Finite Element Method; Permanent Magnets; Rotors; Turbines

20050196282 Naval Postgraduate School, Monterey, CA USA
Energy Systems of Ukraine: Characteristics, Dependence and Influence on Economic and Political Self-Determination
Pavlenko, Valerii; Jun. 2005; 73 pp.; In English
Report No.(s): AD-A435366; No Copyright; Avail: Defense Technical Information Center (DTIC)
The purpose of this thesis is to conduct an analysis of the current composition of Ukrainian energy systems, analyze its dependence on Russian energy sources, explore alternatives to diversify the supply of fuel resources, and offer insights on the best possible solution for Ukraine. Currently, a substantial part of energy in Ukraine is produced with gas and oil supplied from Russia. A monopoly supplier might cause significant dependence of the domestic economy upon a foreign country. This might give the supplier country an opportunity to control and dictate. The Russian President and much of the political leadership did not support the most recent political developments in Ukraine (e.g., Presidential elections, 'Orange Revolution'). Ukraine's political goals include development of closer cooperation with the EU, U.S. and NATO. This would not match Russian foreign policy interests towards former Soviet Republics. Economic influence by Russia could be used to influence Ukrainian foreign policy. The goals of this thesis are to show that the search for alternative sources of energy for Ukraine is a very important aspect for economic and political independence, and also to identify alternatives for the development of the Ukrainian energy market.
DTIC
Economics; Ukraine

20050196604 NASA Glenn Research Center, Cleveland, OH, USA
Surface Texturing Investigated for a High Solar Absorptance Low Infrared Emittance Solar Collector
Jaworske, Donald A.; Research and Technology 2000; March 2001; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy
The objective of this work was to design, build, and vacuum test a high solar absorptance, low infrared emittance solar collector for heat engine and thermal switching applications. Mini-satellites proposed by the Applied Physics Laboratory for operation in environments that are subject to radiation threat may utilize a heat engine for power and a thermal bus for thermal control. To achieve this goal, a surface having high solar absorptance and low infrared emittance is needed. At the NASA Glenn Research Center, one concept being pursued to achieve this goal is texturing high thermal conductivity graphite epoxy composites using a directed atomic oxygen beam and then coating the textured surface with a reflective metallic coating. Coupons were successfully textured, coated, and evaluated. A variety of texturing conditions were explored, and textures were documented by scanning electron microscopy. Copper, gold, silver, iridium, and aluminum coatings were applied, and the highest solar absorptance to infrared emittance ratio was found to be 1.3. A full-sized solar collector was manufactured with this ratio, and the amount of heat collected was observed using an Inconel calorimeter installed in a bench-top vacuum chamber equipped with a solar simulator. Results to date indicate good heat flow through the system, with 9 W of heat flow measured by the calorimeter.
Author
Surface Properties; Design Analysis; Manufacturing; Vacuum Tests; Solar Collectors; Switching

20050196607 NASA Glenn Research Center, Cleveland, OH, USA
High-Efficiency Solar Thermal Vacuum Demonstration Completed for Refractive Secondary Concentrator
Wong, Wayne A.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy
Common to many of the space applications that utilize solar thermal energy--such as electric power conversion, thermal propulsion, and furnaces--is a need for highly efficient, solar concentration systems. An effort is underway at the NASA Glenn

Research Center to develop the refractive secondary concentrator, which uses refraction and total internal reflection to efficiently concentrate and direct solar energy. When used in combination with advanced lightweight primary concentrators, the refractive secondary concentrator enables very high system concentration ratios (10,000 to 1) and very high temperatures (\g2000 K). The innovative refractive secondary concentrator offers significant advantages over all other types of secondary concentrators. The refractive secondary offers the highest throughput efficiency, provides for flux tailoring, requires no active cooling, relaxes the pointing and tracking requirements of the primary concentrator, and enables very high system concentration ratios. This technology has broad applicability to any system that requires the conversion of solar energy to heat. Glenn initiated the development of the refractive secondary concentrator in support of Shooting Star, a solar thermal propulsion flight experiment, and continued the development in support of Space Solar Power.
Derived from text
Solar Collectors; Refractivity; Solar Total Energy Systems

20050196668 NASA Glenn Research Center, Cleveland, OH, USA
Power and Efficiency Optimized in Traveling-Wave Tubes Over a Broad Frequency Bandwidth
Wilson, Jeffrey D.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A traveling-wave tube (TWT) is an electron beam device that is used to amplify electromagnetic communication waves at radio and microwave frequencies. TWT's are critical components in deep space probes, communication satellites, and high-power radar systems. Power conversion efficiency is of paramount importance for TWT's employed in deep space probes and communication satellites. A previous effort was very successful in increasing efficiency and power at a single frequency (ref. 1). Such an algorithm is sufficient for narrow bandwidth designs, but for optimal designs in applications that require high radiofrequency power over a wide bandwidth, such as high-density communications or high-resolution radar, the variation of the circuit response with respect to frequency must be considered. This work at the NASA Glenn Research Center is the first to develop techniques for optimizing TWT efficiency and output power over a broad frequency bandwidth (ref. 2). The techniques are based on simulated annealing, which has the advantage over conventional optimization techniques in that it enables the best possible solution to be obtained (ref. 3). Two new broadband simulated annealing algorithms were developed that optimize (1) minimum saturated power efficiency over a frequency bandwidth and (2) simultaneous bandwidth and minimum power efficiency over the frequency band with constant input power. The algorithms were incorporated into the NASA coupled-cavity TWT computer model (ref. 4) and used to design optimal phase velocity tapers using the 59- to 64-GHz Hughes 961HA coupled-cavity TWT as a baseline model. In comparison to the baseline design, the computational results of the first broad-band design algorithm show an improvement of 73.9 percent in minimum saturated efficiency (see the top graph). The second broadband design algorithm (see the bottom graph) improves minimum radiofrequency efficiency with constant input power drive by a factor of 2.7 at the high band edge (64 GHz) and increases simultaneous bandwidth by 500 MHz.
Author
Bandwidth; Traveling Wave Tubes; Electromagnetic Radiation; Electron Beams; Energy Conversion Efficiency; Communication Satellites; Microwave Frequencies; Radio Frequencies; Space Probes

20050198932 Swales Aerospace, USA
High Temperature Heat Rejection System for Large Heat Loads; Architecture and Trade Study Results
Nilitkin, Michael N.; Allen, Robert W.; [2004]; 9 pp.; In English; 34th International Conference on Environment Systems, 19-22 Jul. 2004, Colorado Springs, CO, USA
Contract(s)/Grant(s): NAS3-02204; WBS 22-973-10-22
Report No.(s): SAE-041CES-385; E-14755; Copyright; Avail: Other Sources

To investigate space nuclear reactor technologies, NASA has awarded several contracts under Project Prometheus, the Nuclear Systems Program. The effort described in this paper was performed under one of those contracts (the Brayton NRA) . Like all power conversion systems, nuclear power conversion systems operate at efficiencies less than 100% resulting in the need to reject waste heat to space. Several different HRSs (Heat Rejection Systems) potential designs have been identified for rejecting NEP (Nuclear Electric Power) waste heat and several of them for a CBC (Closed Brayton Cycle) power conversion system are described herein and the results of their initial analyses presented. The analyses presented were performed as part of an initial trade study to recommend a promising HRS for advancement of its TRL.
Author
Nuclear Reactors; Nuclear Electric Power Generation; Aerospace Engineering

20050198948 NASA Glenn Research Center, Cleveland, OH, USA
High Temperature Solar Cell Development
Landis, Geoffrey A.; Raffaelle, Ryne P.; Merritt, Danielle; [2004]; 3 pp.; In English; 19th European Photovoltaic Solar Energy Power Conference, 7-11 Jun. 2004, Paris, France
Contract(s)/Grant(s): NCC3-953; WBS 22-319-20-B1
Report No.(s): E-14871; No Copyright; Avail: CASI; A01, Hardcopy

The majority of satellites and near-earth probes developed to date have used photovoltaic arrays for power generation. If future mission to probe environments close to the sun will be able to use photovoltaic power, solar cells that can function at high temperatures, under high light intensity, and high radiation conditions must be developed. In this paper, we derive the optimum bandgap as a function of the operating temperature.
Author
High Temperature Environments; Operating Temperature; Spacecraft Power Supplies; Solar Probes; Solar Cells; Energy Gaps (Solid State)

20050198962 NASA Glenn Research Center, Cleveland, OH, USA
Extended Temperature Solar Cell Technology Development
Landis, Geoffrey A.; Jenkins, Phillip; Scheiman, David; Rafaelle, Ryne; [2004]; 7 pp.; In English; AIAA 2nd International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA
Contract(s)/Grant(s): NCC3-953; WBS 22-319-20-81
Report No.(s): E-14872; Copyright; Avail: CASI; A02, Hardcopy

Future NASA missions will require solar cells to operate both in regimes closer to the sun, and farther from the sun, where the operating temperatures will be higher and lower than standard operational conditions. NASA Glenn is engaged in testing solar cells under extended temperature ranges, developing theoretical models of cell operation as a function of temperature, and in developing technology for improving the performance of solar cells for both high and low temperature operation.
Author
Solar Cells; High Temperature Tests; Low Temperature Tests; Operating Temperature

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ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20050194593 Texas Commission on Environmental Quality, Austin, TX, USA
Texas Clean Fleet Program: Guidelines for Private and Local Government Fleets
Jul. 2004; 84 pp.; In English
Report No.(s): PB2005-107776; RG-321; No Copyright; Avail: CASI; A05, Hardcopy

This guide has been developed to answer questions about compliance requirements of the Texas Clean Fleet (TCF) Program. The TCF Program requires private, local government, and transit fleet owners in certain areas to acquire a percentage of low-emission vehicles (LEVs) when replacing or adding fleet vehicles. LEVs reduce tailpipe emissions of volatile organic compounds, oxides of nitrogen, and carbon monoxide. Starting with model year 2004 vehicles, the U.S. Environmental Protection Agency (EPA) has begun implementing new vehicle emission standards known as the Tier 2 standards. Vehicles rated at a Tier 2 bin level that is equivalent to LEV or cleaner, will be considered LEVs for the purposes of the TCF Program. This guide was published by the Texas Commission on Environmental Quality (TCEQ).
NTIS
Carbon Monoxide; Air Pollution; Environmental Quality

20050194599 Environmental Protection Agency, Research Triangle Park, NC USA
User's Guide for the AERMOD Meteorological Preprocessor (AERMET)
Nov. 2004; 260 pp.; In English
Report No.(s): PB2005-107381; EPA-454/B-03-002; No Copyright; Avail: CASI; A12, Hardcopy

The U. S. Environmental Protection Agency (EPA), in conjunction with the American Meteorological Society (AMS), has developed a new air quality dispersion model, the AMS/EPA Regulatory Model (AERMOD). This model requires a preprocessor that organizes and processes meteorological data and estimates the necessary boundary layer parameters for

dispersion calculations in AERMOD. The meteorological preprocessor that serves this purpose is AERMET.
NTIS
Air Quality; Diffusion; Environment Models

20050194606 Karlsruhe Univ., Germany
Removal of Particles and Acid Gases (S2 or HCl) with a Ceramic Filter by Addition of Dry Sorbents
Hemmer, G.; Kasper, G.; January 2005; 16 pp.; In English
Report No.(s): DE2005-837305; No Copyright; Avail: Department of Energy Information Bridge

The present investigation intends to add to the fundamental process design know-how for dry flue gas cleaning, especially with respect to process flexibility, in cases where variations in the type of fuel and thus in concentration of contaminants in the flue gas require optimization of operating conditions. In particular, temperature effects of the physical and chemical processes occurring simultaneously in the gas-particle dispersion and in the filter cake/filter medium are investigated in order to improve the predictive capabilities for identifying optimum operating conditions. Sodium bicarbonate (NaHCO3) and calcium hydroxide (Ca(OH2) are known as efficient sorbents for neutralizing acid flue gas components such as HCl, HF, and SO2. According to their physical properties (e.g. porosity, pore size) and chemical behavior (e.g. thermal decomposition, reactivity for gas-solid reactions), optimum conditions for their application vary widely. The results presented concentrate on the development of quantitative data for filtration stability and overall removal efficiency as affected by operating temperature. Experiments were performed in a small pilot unit with a ceramic filter disk of the type Dia-Schumalith 10-20, using model flue gases containing SO2 and HCl, flyash from wood bark combustion, and NaHCO3 as well as Ca(OH2) as sorbent material (particle size d(sub 50)/d(sub 84):35/192 microns, and 3.5/16, respectively). The pilot unit consists of an entrained flow reactor (gas duct) representing the raw gas volume of a filter house and the filter disk with a filter cake, operating continuously, simulating filter cake build-up and cleaning of the filter medium by jet pulse. Temperatures varied from 200 to 600 C, sorbent stoichiometric ratios from zero to 2, inlet concentrations were on the order of 500 to 700 mg/sq m, water vapor contents ranged from zero to 20 vol%. The experimental program with NaHCO3 is listed. In addition, model calculations were carried out based on own and published experimental results that estimate residence time and temperature effects on removal efficiencies
NTIS
Ceramics; Cleaning; Contaminants; Drying; Flue Gases; Sorbents

20050194615 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, California Univ., Los Angeles, CA, USA, Environmental Protection Agency, Oakland, CA, USA, California Dept. of Health Services, Oakland, CA, USA
School Indoor Environmental Quality Assessments and Interventions: Benefits of Effective Partnerships in California
Shendell, D. G.; Apte, M. G.; Kim, J.; January 2005; 16 pp.; In English
Report No.(s): DE2005-836792; No Copyright; Avail: Department of Energy Information Bridge

Public, private, government, and university stakeholders have focused increasing attention on children's environmental health. Priority areas have been healthy school environments including indoor air and environmental quality (IEQ); susceptibilities of children to environmental factors and associated illness; and, understanding exposure to biological, chemical, and physical agents. As multidisciplinary teams, studies and intervention demonstrations in California public schools were conducted. A common theme among them was a 'partnership,' the collaboration between stakeholders from the aforementioned sectors. Federal funding and local bond measures for planning, maintenance, and modernization of school facilities have recently been authorized. Therefore, beneficial 'partnerships' should be established to conduct needed IEQ, environmental health, and productivity research, development and demonstration. This commentary describes benefits for stakeholders and five strategies for future effective collaborations.
NTIS
Air Quality; Children; Environmental Quality; Health; Indoor Air Pollution; Public Health; Schools

20050194623 Department of Energy, Washington, DC USA
Disruptive Event Biosphere Dose Conversion Factor Analysis
January 2005; 96 pp.; In English
Report No.(s): DE2005-827810; No Copyright; Avail: Department of Energy Information Bridge

This analysis report, Disruptive Event Biosphere Dose Conversion Factor Analysis, is one of the technical reports containing documentation of the ERMYN (Environmental Radiation Model for Yucca Mountain Nevada) biosphere model for the geologic repository at Yucca Mountain, its input parameters, and the application of the model to perform the dose assessment for the repository. The biosphere model is one of a series of process models supporting the Total System

Performance Assessment (TSPA) for the Yucca Mountain repository. A graphical representation of the documentation hierarchy for the ERMYN is presented in Figure 1-1. This figure shows the interrelationships among the products (i.e., analysis and model reports) developed for biosphere modeling and provides an understanding of how this analysis report contributes to biosphere modeling. This report is one of the two reports that develop biosphere dose conversion factors (BDCFs), which are input parameters for the TSPA model. The Biosphere Model Report (BSC 2003 (DIRS 164186)) describes in detail the conceptual model as well as the mathematical model and lists its input parameters. Model input parameters are developed and described in detail in five analysis report (BSC 2003 (DIRS 160964), BSC 2003 (DIRS 160965), BSC 2003 (DIRS 160976), BSC 2003 (DIRS 161239), and BSC 2003 (DIRS 161241)). The objective of this analysis was to develop the BDCFs for the volcanic ash exposure scenario and the dose factors (DFs) for calculating inhalation doses during volcanic eruption (eruption phase of the volcanic event). The volcanic ash exposure scenario is hereafter referred to as the volcanic ash scenario.
NTIS
Biosphere; Factor Analysis; Radiation Dosage; Environment Models

20050194625 UK Atomic Energy Authority, Harwell, UK
Decommissioning of Shielded Facilities at Winfrith Used for Post Irradiation Examination of Nuclear Fuels and Other Active Items
Miller, K. D.; Parkinson, S. J.; Cornell, R. M.; January 2003; 16 pp.; In English
Report No.(s): DE2005-826080; No Copyright; Avail: Department of Energy Information Bridge
This paper describes the approaches used in the clearing, cleaning, decontamination and decommissioning of a very large suite of seven concrete shielded caves and other facilities used by UKAEA at Winfrith Technology Centre, England over a period of about 30 years for the post-irradiation examination (PIE) of a wide range of nuclear fuels and other very active components. The basic construction of the facilities will first be described, setting the scene for the major challenges that 1970s' thinking posed for decommissioning engineers. The tendency then to use large and heavy items of equipment supported upon massive steel bench structures produced a series of major problems that had to be overcome. The means of solving these problems by utilization of relatively simple and inexpensive equipment will be described. Later, a further set of challenges was experienced to decontaminate the interior surfaces to allow man entries to be undertaken at acceptable dose rates. The paper will describe the types of tooling used and the range of complementary techniques that were employed to steadily reduce the dose rates down to acceptable levels. Some explanations will also be given for the creation of realistic dose budgets and the methods of recording and continuously assessing the progress against these budgets throughout the project. Some final considerations are given to the commercial approaches to be adopted throughout this major project by the decommissioning engineers. Particular emphasis will be given to the selection of equipment and techniques that are effective so that the whole process can be carried out in a cost-effective and timely manner. The paper also provides brief complementary information obtained during the decommissioning of a plutonium-contaminated facility used for a range of semi-experimental purposes in the late 1970s. The main objective here was to remove the alpha contamination in such a manner that the volume of Plutonium Contaminated Materials (PCM) was minimized and to clean the whole facility to a free-breathing state such that it would be available for other work or subsequent demolition.
NTIS
Caves; Decommissioning; Decontamination; Irradiation; Nuclear Electric Power Generation; Nuclear Fuels; Radiation Effects; Radioactive Wastes; United Kingdom; Waste Management

20050194642 Vista Engineering Technologies, LLC, Kennewick, WA, USA
HEPA Filter Use at the Hanford Site
Kriskovich, J. R.; Feb. 2002; 28 pp.; In English
Report No.(s): DE2005-834125; No Copyright; Avail: Department of Energy Information Bridge
High Efficiency Particulate Air (HEPA) filters are relied upon at the Hanford site to support several different activities. Each facility relies upon the filters to provide the same function; remove radioactive particulate from various air streams. However, HEPA filters are operated in differing environmental conditions from one facility to another and the constituents in the air streams also differ. In addition, some HEPA filters at the Hanford site have been in service for several years. As a result, an assessment was performed which evaluated the service life and conditions of the HEPA filters at the Hanford site.
NTIS
Air Filters; Particulates; Radioactive Wastes

20050194649 Department of Energy, Washington, DC USA
Soil-Related Input Parameters for the Biosphere Model
January 2005; 52 pp.; In English
Report No.(s): DE2005-827811; No Copyright; Avail: Department of Energy Information Bridge

This analysis is one of the technical reports containing documentation of the Environmental Radiation Model for Yucca Mountain Nevada (ERMYN), a biosphere model supporting the Total System Performance Assessment (TSPA) for the geologic repository at Yucca Mountain. The biosphere model is one of a series of process models supporting the Total System Performance Assessment (TSPA) for the Yucca Mountain repository. A graphical representation of the documentation hierarchy for the ERMYN biosphere model is presented. This figure shows the interrelationships among the products (i.e., analysis and model reports) developed for biosphere modeling, and the plan for development of the biosphere abstraction products for TSPA, as identified in the 'Technical Work Plan: for Biosphere Modeling and Expert Support' (BSC 2003 (163602)). It should be noted that some documents may be under development at the time this report is issued and therefore not available. This figure is included to provide an understanding of how this analysis report contributes to biosphere modeling in support of the license application, and is not intended to imply that access to the listed documents is required to understand the contents of this report. This report, 'Soil Related Input Parameters for the Biosphere Model', is one of the five analysis reports that develop input parameters for use in the ERMYN model. This report is the source documentation for the six biosphere parameters identified. 'The Biosphere Model Report' (BSC 2003 (160699)) describes in detail the conceptual model as well as the mathematical model and its input parameters. The purpose of this analysis was to develop the biosphere model parameters needed to evaluate doses from pathways associated with the accumulation and depletion of radionuclides in the soil. These parameters support the calculation of radionuclide concentrations in soil from on-going irrigation and ash deposition and, as a direct consequence, radionuclide concentration in resuspended particulate matter in the atmosphere. The analysis was performed in accordance with the technical work plan for the biosphere modeling and expert support (TWP) (BSC 2003 (163602)). This analysis revises the previous one titled 'Evaluate Soil/Radionuclide Removal by Erosion and Leaching' (CRWMS M&O 2001 (152517)). In REV 00 of this report, the data generated were fixed (i.e., taking no account of uncertainty and variability) values. This revision incorporates uncertainty and variability into the values for the bulk density, elemental partition coefficients, average annual loss of soil from erosion, resuspension enhancement factor, and field capacity water content.
NTIS
Biosphere; Soil Science; Atmospheric Models; Environment Models; Moisture Content

20050195977 Strategic Environmental Research and Development Program, Arlington, VA USA
Annual Report to Congress - Fiscal Year 2000, from the Strategic Environmental Research and Development Program
Mar. 2001; 370 pp.; In English
Report No.(s): AD-A434768; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Strategic Environmental Research and Development Program (SERDP) is the Department of Defense's (DoD) corporate environmental science and technology program. To fulfill its mission to address environmental problems through innovative research and share that information across federal and private organizations, SERDP executes the program in partnership with the Department of Energy and the Environmental Protection Agency. Further, SERDP fully leverages complementary programs within the DoD and solicits interest from other public and private research organizations. The organization and management of SERDP is described in Section I. SERDP conducts basic research through advanced technology development in the following four Technology Thrust Areas: Cleanup (including unexploded ordnance), Compliance, Conservation, and Pollution Prevention. Section II describes significant accomplishments achieved during FY 2000 within each of the Thrust Areas. Highlights of these accomplishments include: (1) new technologies capable of detecting unexploded ordnance (UXO) with high detection rates to significantly reduce the cost of DoD site characterization and cleanup; (2) new technologies to remediate and/or contain groundwater contaminated with explosives and ammonium perchlorate; (3) advances to achieve the long-term sustainability of DoD testing and training ranges, including adaptive management of ecosystems and techniques to assess the potential release of energetics pollutants; and (4) the development of less toxic energetic compounds and munitions and a nonhazardous chemical agent resistant coating (CARC) for military hardware. Section III provides an overview of the SERDP Program, including the goals, environmental and operational research drivers, actual and planned funding levels, and planned research initiatives for each Thrust Area. Summaries of each project funded in FY 2000 and those planned for FY 2001 are provided in appendixes A-D.
DTIC
Air Pollution; Congressional Reports; Defense Program; Environment Management; Environment Protection; Pollution Control; Research and Development; Water Pollution

20050195978 Strategic Environmental Research and Development Program, Arlington, VA USA
Annual Report to Congress - Fiscal Year 2002, from the Strategic Environmental Research and Development Program
Mar. 2003; 355 pp.; In English
Report No.(s): AD-A434769; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Strategic Environmental Research and Development Program (SERDP) is the Department of Defense's (DoD) corporate environmental science and technology program. To fulfill its mission to address environmental problems through innovative research and share that information across federal and private organizations, SERDP executes the program in partnership with the Department of Energy and the Environmental Protection Agency. Further, SERDP fully leverages complementary programs within the DoD and solicits interest from other public and private research organizations. The organization and management of SERDP is described in Section I. SERDP conducts basic research through advanced technology development in the following five Technology Thrust Areas: Cleanup, Compliance, Conservation, Pollution Prevention, and Unexploded Ordnance (UXO). Section II describes significant accomplishments achieved during FY 2002 within each of the Thrust Areas. Highlights of these accomplishments include: (1) new technologies to remediate and/or contain groundwater contaminated with explosives and ammonium perchlorate; (2) new technologies capable of detecting UXO with high detection rates to significantly reduce the cost of DoD site characterization and cleanup; (3) advances to achieve the long-term sustainability of DoD testing and training ranges, including techniques to assess the risk posed by residues from live munitions on military ranges; (4) innovative monitoring techniques to ensure that Navy operations do not adversely impact marine mammals; and (5) new steel alloys that eliminate the need for toxic corrosion protection coatings on weapons platforms. Section III provides an overview of the SERDP Program, including the goals, environmental and operational research drivers, actual and planned funding levels, and the planned research initiatives for the Program. Summaries of each project funded in FY 2002 and those planned for FY 2003 are provided in appendixes A-E.
DTIC
Air Pollution; Congressional Reports; Defense Program; Environment Management; Environment Protection; Pollution Control; Research and Development; Water Pollution

20050196222 Industrial Coll. of the Armed Forces, Washington, DC USA
2004 Environment Industry
Cawthorne, John R.; Carroll, Michael J.; Chesnutt, Curt S.; Fidrych, Bud; Gotman, Shalom; Hudson, Edward G.; Kyaka, George N.; Maida, Gregory S.; Pendolino, Timothy J.; Poore, Margaret B.; Jan. 2004; 42 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435138; No Copyright; Avail: Defense Technical Information Center (DTIC)

The environmental industry occupies a strategic position at the crossroads of security, stability, and prosperity. The industry's goods and services have significant implications for the welfare of individuals and the activities of governments. Unfortunately, the U.S. environmental industry is stagnant, with declining growth and revenues. To revive this industry, governments must move beyond compliance-based regulatory programs to find ways to give business incentives to exceed the minimum standards. In addition, the U.S. Government must begin to consider the national security implications inherent in environmental protection. Globally, the health of the environmental industry, and of the environment itself, depends on the world embracing the concept of sustainable development: using the environment today while preserving its use for future generations. This paper provides an overview of the environmental industry divided into two main parts. The first part focuses on the domestic industry -- it defines the environmental industry; analyzes the roles federal and state governments play; assesses the economic factors affecting the industry; looks at technological development in the industry; and discusses environmental management systems. The second part of the paper takes a global view, providing overviews of the state of the environment and the environmental marketplace in four regions of the world: the Americas; Europe; the Middle East; and Africa, Asia, and the Pacific. The intent is to provide additional context to the first part of the paper so that the reader may better judge the overall health of the environment and the environmental industry. In addition, it should bring into focus the huge differences in the challenges facing the developed and developing worlds in this area.
DTIC
Economics; Environment Management; Industries; Policies; United States

20050196737 Minerals Management Service, New Orleans, LA USA
Air Quality: User's Guide for the Gulfwide Offshore Activities Data System (GOADS) (CD with Search/Retrieval Software)
Jul. 2001; In English
Report No.(s): PB2005-500035; OCS-MMS-2001-052-CD; No Copyright; Avail: National Technical Information Service (NTIS)

This User's Guide was prepared under contract between the Minerals Management Service (MMS) and Eastern Research Group, Inc. The Minerals Management Service (MMS) mandated that offshore operators in the Gulf of Mexico participate in an annual survey program for the year 2000, during which time the MMS will collect information regarding offshore operations. The purpose of these surveys is to assist the MMS in constructing an emission inventory for the entire Gulf of Mexico. MMS funded the development of the Gulfwide Offshore Activities Data System (GOADS) software and User's Guide in order to assist offshore operations in complying with the MMS mandate. GOADS assists users in recording information regarding emissions related offshore activities and generates data files that can be delivered to the MMS.
NTIS
Air Quality; Data Systems

20050196749 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Leakage and Seepage in the Near-Surface Environment: An Integrated Approach to Monitoring and Detection
Oldenburg, C. M.; Lewicki, J. L.; January 2005; 10 pp.; In English
Report No.(s): DE2005-837241; No Copyright; Avail: Department of Energy Information Bridge

Monitoring and detection of leakage and seepage of carbon dioxide (CO(sub 2)) in the near-surface environment is needed to ensure the safety and effectiveness of geologic carbon sequestration. Large leakage fluxes, e.g., through leaking wells, will be easier to detect and monitor than slow and diffuse leakage and seepage. The challenge of detecting slow leakage and seepage is discerning a leakage or seepage signal from within the natural background variations in CO(sub 2) concentration and flux that are controlled by a variety of coupled processes in soil. Although there are no direct examples of leaking geologic carbon sequestration sites on which to base a proposed verification approach, we have been guided by our prior simulation studies of CO(sub 2) leakage and seepage, which showed that large CO(sub 2) concentrations can develop in the shallow subsurface even for relatively small CO(sub 2) leakage fluxes. A variety of monitoring technologies exists for measuring CO(sub 2) concentration and flux, but there is a gap between instrument performance and the detection of a leakage or seepage signal from within large natural background variability. We propose an integrated approach to monitoring and verification. The first part of our proposed approach is to characterize and understand the natural ecosystem before CO(sub 2) injection occurs so that future anomalies can be recognized. Measurements of natural CO(sub 2) fluxes using accumulation chamber (AC) and eddy correlation (EC) approaches, soil CO(sub 2) concentration profiles with depth, and carbon isotope compositions of CO(sub 2) are needed to characterize the natural state of the system prior to CO(sub 2) injection. From this information, modeling needs to be carried out to enhance understanding of carbon sources and sinks so that anomalies can be recognized and subject to closer scrutiny as potential leakage or seepage signals. Long-term monitoring using AC, EC, and soil-gas analyses along with ecosystem and flow and transport modeling should continue after CO(sub 2) injection. The integrated use of multiple measurements and modeling offers a promising approach to discerning and quantifying a small CO(sub 2) leakage or seepage signal from within the expected background variability.
NTIS
Leakage; Seepage; Carbon Dioxide

20050196754 California Univ., Berkeley, CA USA, Environmental Protection Agency, Research Triangle Park, NC USA, California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Recovery of Semi-Volatile Organic Compounds During Sample Preparation: Implications for Characterization of Airborne Particulate Matter
Swartz, E.; Stockburger, L.; January 2005; 36 pp.; In English
Report No.(s): DE2005-836366; No Copyright; Avail: Department of Energy Information Bridge

This study began as an effort to validate sample preparation procedures for characterization of gas and particle samples that had been collected with the high capacity (HiC) IOGAPS and related samplers. However, a more general purpose emerged with our growing recognition that insufficient attention to analyte recovery could undermine the efforts of any research team, with any sampling technology, to characterize the wide range of organics associated with PM. Thus, the broader objective is to describe the implications of these recovery results for past and future efforts to speciate airborne semi-volatile and particulate organics. The results of our quality control and quality assurance efforts broadened beyond devising procedures to optimize recovery of specific compounds to (1) exploring the implications of our results for interpretation of past efforts to characterize particulate organics and (2) developing recommendations for future work by any investigators.
NTIS
Air Pollution; Organic Compounds; Particulates; Volatile Organic Compounds

20050196758 Department of Energy, Washington, DC USA
Lignite Fuel Enhancement
Bullinger, C.; Feb. 07, 2005; 18 pp.; In English
Report No.(s): DE2005-837253; No Copyright; Avail: Department of Energy Information Bridge

The Design Team continued to conference this quarter. Their primary task during this timeframe was to finalize the dryer design based on information learned from the NDIC Pilot work and detailed design discussions at Barr offices in August. Heyl-Patterson was tasked with incorporating all comments and drafting drawings. They submitted a preliminary proposal which spawned detailed discussions about tube bundle, air locks, and fire suppression systems. The type of fire protection specified dictated the final structural arrangement. Three meetings were spent discussing the pro's and con's of suppression vs. ventilation systems. In the end, the dryer and bucket elevator will have suppression systems and the remaining equipment will be explosion vented. This is in agreement with GRE's current insurer, FM Global. Three inlet airlocks were reduced to two and four outlets were reduced to three. The inlet plenum was subdivided for greater flexibility and sparging air added in the outlet plenum. It was also decided to use bundles with varied material, diameter, and tube & fin spacing. This will be completed in an effort to identify for us which configuration has the best heat transfer characteristics using coal as the fluidizing medium. The dryer will also be delivered in four pieces. This will allow for installation through the current access door on the Air Heater deck. The Input/Output list and functional description was completed and forwarded to Honeywell to finalize controls. Major pieces of equipment received this quarter were the Bucket Elevator, Liewell Screen, conveyors, and Motor Control Center. ICI completed removal of the wall separating Silo 28 from the dryer area; handrail and grating between the two areas has also been removed. They relocated a blowdown line. They moved an Air Heater basket access hatch.
NTIS
Augmentation; Coal; Drying Apparatus; Lignite

20050196761 West Virginia Univ., Morgantown, WV, USA
Nondestructive Evaluation of Stiffness and Stresses of Ceramic Candle Filters at Elevated Temperature under Vibrational Environment
January 2005; 18 pp.; In English
Report No.(s): DE2005-836130; No Copyright; Avail: Department of Energy Information Bridge

In recent years a significant amount of effort has been devoted to develop damage-tolerant hot gas filter elements, which can withstand chemical, high pressure and extreme thermal cyclic loading in the coal-based environment (Alvin 1999, Spain and Starrett 1999). Ceramic candle filters have proven to be an effective filter for the ash laden gas streams, protecting the gas turbine components from exposure to particulate matter (Lippert et al. 1994). Ceramic candle filters need to sustain extreme thermal environment and vibration-induced stresses over a great period of time. Destructive tests have been used to describe physical, mechanical and thermal properties of the filters and to relate these properties and behaviors to in-service performance, and ultimately to predict the useful life of the filter materials (Pontius and Starrett 1994, Alvin et al. 1994). Nondestructive evaluation (NDE) techniques have been developed to determine the deterioration or the presence of damage and to estimate the remaining stiffness of ceramic candle filters (Chen and Kiriakidis 2001). This paper presents a study of parameters involved in the prediction of remaining life of ceramic candle filters under service conditions. About one hundred ceramic candle filters from previous studies (Chen and Kiriakidis 2000) and forty-six filters received during this project have been nondestructively evaluated. They are divided in Pall Vitropore, Schumacher and Coors filters. Forty-six of these filters were used having various in-service exposure times at the PSDF and the rest were unused filters. Dynamic characterization tests were employed to investigate the material properties of ceramic candle filters. The vibration frequency changes due to exposure hours, dust cake accumulation, candle's axisymmetry, boundary conditions and elevated temperatures are studied. Investigations on fatigue stresses of the filters due to vibration of the plenum and back pulse shaking are also studied. Finite element models (FEM) are built to calculate the filter's dynamic response with different boundary conditions at various temperatures. The experimental natural frequencies of the candle filters were also compared with an analysis of a general Timoshenko beam equation that includes various boundary restraints.
NTIS
Ceramics; High Temperature; Nondestructive Tests; Stiffness; Vibration

20050196766 Texas Commission on Environmental Quality, Austin, TX, USA
Vapor Recovery Test Procedures Handbook
Dec. 2002; 92 pp.; In English
Report No.(s): PB2005-107784; RG-399; No Copyright; Avail: CASI; A05, Hardcopy

Efficient operation of vapor recovery systems is critical to the improvement of air quality across the state. This Handbook

outlines procedures which must be followed in order to ensure accurate and consistent test results.
NTIS
Handbooks; Refueling; Vapors

20050198955 Washington Univ., Seattle, WA, USA
Clean Air Slots Amid Atmospheric Pollution
Hobbs, Peter V.; Nature; February 21, 2002; Volume 415, pp. 861; In English
Contract(s)/Grant(s): NAG5-9022; Copyright; Avail: Other Sources
This article investigates the mechanism for those layers in the atmosphere that are free of air borne pollution even though the air above and below them carry pollutants. Atmospheric subsidence is posed as a mechanism for this phenomenon.
CASI
Air Pollution; Slots; Subsidence; Atmospheric Effects

20050199437 Department of Energy, Washington, DC USA
Evaluation of Features, Events, and Processes (FEP) for the Biosphere Model
January 2005; 100 pp.; In English
Report No.(s): DE2005-827809; No Copyright; Avail: Department of Energy Information Bridge
The purpose of this report is to document the evaluation of biosphere features, events, and processes (FEPs) that relate to the license application (LA) process as required by the U.S. Nuclear Regulatory Commission (NRC) regulations at 10 CFR 63.114 (d, e, and f) (DIRS 156605). The evaluation determines whether specific biosphere-related FEPs should be included or excluded from consideration in the Total System Performance Assessment (TSPA).
NTIS
Biosphere; Radioactive Isotopes; Mathematical Models

20050199438 Department of Energy, Washington, DC USA
Evaluation of Features, Events, and Processes (FEP) for the Biosphere Model
January 2005; 54 pp.; In English
Report No.(s): DE2005-836506; No Copyright; Avail: Department of Energy Information Bridge
The purpose of this revision of 'Evaluation of the Applicability of Biosphere-Related Features, Events, and Processes (FEPs)' (BSC 2001) is to document the screening analysis of biosphere-related primary FEPs, as identified in 'The Development of Information Catalogued in REV00 of the YMP FEP Database' (Freeze et al. 2001), in accordance with the requirements of the final U.S. Nuclear Regulatory Commission (NRC) regulations at 10 CFR Part 63. This database is referred to as the Yucca Mountain Project (YMP) FEP Database throughout this document. Those biosphere-related primary FEPs that are screened as applicable will be used to develop the conceptual model portion of the biosphere model, which will in turn be used to develop the mathematical model portion of the biosphere model. As part of this revision, any reference to the screening guidance or criteria provided either by Dyer (1999) or by the proposed NRC regulations at 64 FR 8640 has been removed. The title of this revision has been changed to more accurately reflect the purpose of the analyses. In addition, this revision will address Item Numbers 19, 20, 21, 25, and 26 from Attachment 2 of 'U.S. Nuclear Regulatory Commission/U.S. Department of Energy Technical Exchange and Management Meeting on Total System Performance Assessment and Integration (August 6 through 10, 2001)' (Reamer 2001). This Scientific Analysis Report (SAR) does not support the current revision to the YMP FEP Database (Freeze et al. 2001).
NTIS
Biosphere; Energy Transfer; Management Systems

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GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20050188752 Army Engineer Research and Development Center, Vicksburg, MS USA
Seismic Structural Considerations for the Stem and Base of Retaining Walls Subjected to Earthquake Ground Motions
Strom, Ralph W.; Ebeling, Robert W.; May 2005; 191 pp.; In English
Report No.(s): AD-A434485; ERDC/ITL-TR-05-3; No Copyright; Avail: CASI; A09, Hardcopy

Cantilever retaining walls can respond externally to earthquake ground motions by sliding or by rotating, or internally by stem wall yielding. The type of response that will have the greatest impact on post-earthquake performance will likely depend on restraint conditions at the base of the wall. Walls founded on soil without an invert slab are most likely to dissipate the inertial energy imposed by earthquake ground motions by sliding. This may also be true for walls founded on fissured or fractured rock. Walls founded on soil or on fissured or fractured rock and prevented by an invert slab from moving laterally are more likely to tip (i.e., rotate) than to slide during a major earthquake event. Walls founded on competent rock without significant joints, faults, or bedding planes and prevented by a strong bond at the rock-footing interface from either translating or rotating are likely to dissipate energy through plastic yielding in the stem wall. All three responses can leave the retaining wall in a permanently displaced condition. The purpose of this report is to provide methodologies for conducting a performance-based earthquake evaluation related to plastic yielding in the stem wall. The methodologies include evaluation of brittle or force-controlled actions and the evaluation of ductile or deformation-controlled actions. The later evaluation provides estimates of permanent (residual) displacement for walls dominated by a stem wall yielding response.
DTIC
Earth Movements; Earthquakes; Retaining; Walls

20050188772 Air Force Research Lab., Hanscom AFB, MA USA
Longitudinal Variability of Equatorial Plasma Bubbles Observed by DMSP and ROCSAT-1
Burke, W. J.; Gentile, L. C.; Huang, C. Y.; Valladares, C. E.; Su, S. Y.; Dec. 2004; 17 pp.; In English
Contract(s)/Grant(s): Proj-2311
Report No.(s): AD-A434530; AFRL-VS-HA-TR-2005-1059; No Copyright; Avail: CASI; A03, Hardcopy

We compare observations of equatorial plasma bubbles (EPBs) by polar-orbiting satellites of the Defense Meteorological Satellite Program (DMSP) with plasma density measurements from the Republic of China Satellite (ROCSAT-1) in a low-inclination orbit. DMSP data were acquired in the evening sector at low magnetic latitudes between 1989 and 2002. ROCSAT-1 plasma densities were measured in March and April of 2000 and 2002. Observations of individual EPBs detected by both ROCSAT-1 and DMSP were well correlated when satellite orbital paths crossed the same longitude within approximately plus or minus 15 min. We compiled a statistical database of ROCSAT-1 occurrence rates sorted by magnetic local time (MLT), magnetic latitude, and geographic longitude. The rate of ROCSAT-1 EPB encounters at topside altitudes rose rapidly after 1930 MLT and peaked between 2000 and 2200 MLT, close to the orbital planes of DMSP F12, F14, and F15. EPB encounter rates have Gaussian distributions centered on the magnetic equator with half widths of ^8. Longitudinal distributions observed by ROCSAT-1 and DMSP are qualitatively similar, with both showing significantly fewer occurrences than expected near the west coast of South America. A chain of GPS receivers extending from Colombia to Chile measured a west-to-east gradient in S4 indices that independently confirms the existence of a steep longitudinal gradient in EPB occurrence rates. We suggest that precipitation of energetic particles from the inner radiation belt causes the dearth of EPBs. Enhancements in the post sunset ionospheric conductance near the South Atlantic Anomaly cause a decrease in growth rate for the generalized Rayleigh-Taylor instability. Results indicate substantial agreement between ROCSAT-1 and DMSP observations and provide new insights on EPB phenomenology.
DTIC
Bubbles; Dmsp Satellites; Equatorial Regions; Magnetic Fields; Meteorological Satellites; Plasma Bubbles; Scintillation; Variability

20050188774 Boston Coll., Chestnut Hill, MA USA
On the Onset of HF-Induced Airglow at HAARP
Mishin, E. V.; Burke, W. J.; Pedersen, T.; Feb. 2004; 11 pp.; In English
Contract(s)/Grant(s): Proj-2311
Report No.(s): AD-A434533; AFRL-VS-HA-TR-2005-1081; No Copyright; Avail: CASI; A03, Hardcopy

Observations of airglow at 630 nm (red line) and 557.7 nm (green line) during the February 2002 campaign at the High Frequency Active Auroral Research Program (HAARP) heating facility are analyzed. We find that during injections toward magnetic zenith (MZ) the green and red lines gain ^5 R within ^1 s and ^20 R within ^10 s, respectively. We term this period the onset of the HF-induced airglow. A model of the onset at magnetic zenith is developed. It accounts for background photoelectrons and dissociative recombination of O(+)2. It is shown that heating and acceleration of background electrons dominate the airglow onset. We propose a scenario for the generation of strong Langmuir turbulence for injections outside the Spitze region, including magnetic zenith.
DTIC
Airglow; High Frequencies

20050188775 Boston Coll., Chestnut Hill, MA USA
HF-Induced Airglow at Magnetic Zenith: Theoretical Considerations
Mishin, E. V.; Burke, W. J.; Pedersen, T.; Jan. 2005; 6 pp.; In English
Report No.(s): AD-A434534; AFRL-VS-HA-TR-2005-2058; No Copyright; Avail: CASI; A02, Hardcopy

Observations of airglow at 630 nm (red line) and 557.7 nm (green line) during HF modification experiments at the High Frequency Active Auroral Research program (HAARP) heating facility are analyzed. We propose a theoretical framework for understanding the generation of Langmuir and ion acoustic waves during magnetic zenith injections. We show that observations of HF-induced airglow in an underdense ionosphere as well as a decrease in the height of the emitting volume are consistent with this scenario.
DTIC
Airglow; High Frequencies

20050188797 Air Force Research Lab., Hanscom AFB, MA USA
Transient Sheets of Field-Aligned Current Observed by DMSP During the Main Phase of a Magnetic Superstorm
Huang, Cheryl Y.; Burke, William J.; Jun. 2004; 18 pp.; In English
Contract(s)/Grant(s): Proj-2311
Report No.(s): AD-A434562; AFRL-VS-HA-TR-2005-1063; No Copyright; Avail: CASI; A03, Hardcopy

Reported are the first observations of intense (^1 A/m) but transient sheets of field-aligned currents (FACS) that couple of the central plasma sheet with the auroral ionosphere near the maximum epochs of magnetic superstorms. Maximum magnetic perturbations associated with the FACs normally develop at middle (55 deg - 60 deg) magnetic latitudes. Our attention was drawn to these phenomena while comparing ground magnetometer responses to measurements by particle and field sensors on Defense Meteorological Satellite Program (DMSP) satellite during a 4-hour period on 6 April 2000. Six empirical aspects of the data appeared to be unusual.
DTIC
Dmsp Satellites; Magnetic Disturbances; Magnetic Storms

20050188798 Massachusetts Inst. of Tech., Cambridge, MA USA
Quantifying Channelized Submarine Depositional Systems From Bed to Basin Scale
Lyons, William J., III; Sep. 2004; 255 pp.; In English
Report No.(s): AD-A434565; MIT/WHOI-2004-15; No Copyright; Avail: CASI; A12, Hardcopy

In this thesis, I employ 3-D seismic data and outcrops to study turbidites from bed to basin scales. Using seismic data from the Fisk Basin, Gulf of Mexico, I develop a method to estimate the time frame over which sedimentation and subsidence come into equilibrium within a basin. Basin-specific equilibrium times are found to range from 4.6x10(exp 5) years to 2.0x10(exp 5) years, depending upon depositional architecture. Such equilibrium times are critical; they define the threshold at which we can differentiate autogenic and allogenic stratigraphic signals. At the scale of turbidite beds, grain size analyses of sediment samples from the Capistrano Formation, San Clemente, California, reveal the potential for misinterpretation that arises when deposits are studied without consideration of sedimentation dynamics. Simple bed shear calculations and Froude scaling indicate that, in contrast to earlier work, the coarse Capistrano Formation sediments are consistent with classical muddy, low-density turbidity currents. Finally, at the scale of amalgamated turbidite beds, outcrop mapping and aerial photography of the Zerrissene Turbidite System, Namibia, provide a measure of the lateral and vertical continuity of a deepwater turbidite system. The extensive continuous exposure of the Zerrisene reveal that correlation lengths of these systems can exceed 1.5 km.
DTIC
Channel Flow; Sediments; Turbidity

20050188801 Utah State Univ., Logan, UT USA
Development of an Advanced OH Mesospheric Temperature Mapper for Correlative Dynamical Studies at the ALOMAR Arctic Observatory (69 degree N)
Taylor, Michael J.; May 2005; 10 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0258
Report No.(s): AD-A434569; AFRL-SR-AR-TR-05-0213; No Copyright; Avail: CASI; A02, Hardcopy

This report summarizes work performed under DURIP grant No F49620-02-1-0258, awarded to the Space Dynamics Laboratory, Utah State University Research Foundation (USURF) for the design and development of a novel infrared image

for mapping mesospheric temperature and its variability at high-latitudes. This instrument concept was proposed by Dr. M. Taylor and Dr. W. P. Pendleton, Jr. and utilized state-of-the-art system components to achieve a new capability in wide-field (120 deg) narrow band (^2 nm) measurements of the mesospheric OH meinel nightglow emissions (altitude ^ 87 km) to study atomospheric radiance and temperature changes with high spatial and temporal precision.
DTIC
Arctic Regions; Atmospheric Temperature; Infrared Detectors; Mapping; Mesosphere; Observatories

20050192468 NASA Goddard Space Flight Center, Greenbelt, MD, USA
New Data Source for Studying and Modelling the Topside Ionosphere
Huang, Xue-Qin; Reinisch, Bodo; Bilitza, Dieter; Benson, Robert; [2001]; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-8145; No Copyright; Avail: CASI; A03, Hardcopy

The existing uncertainties about density profiles in the topside ionosphere, i.e., in the height regime from hmF2 to approx. 2000 km, requires the search for new data sources. Millions of ionograms had been recorded by the ISIS and Alouette satellites in the sixties and seventies, that never were analyzed in terms of electron density profiles. In recent years an effort started to digitize the analog recordings to prepare the ionograms for computerized analysis. This paper shows how the digital ionograms are processed and the electron density profiles (from satellite orbit altitude, 1400 km for ISIS-2, down to the F peak) are calculated. The most difficult part of the task is the automatic scaling of the echo traces in the ISIS ionograms. Unlike the ionograms from modern ionosondes, the ISIS ionograms do not identify the wave polarization of the different echo traces, so physical logic must be applied to identify the ordinary ()) and extraordinary (X) traces, and this is not always successful. Characteristic resonance features seen in the topside ionograms occur at the gyro and plasma frequencies. An elaborate scheme was developed to identify these resonance frequencies in order to determine the local plasma and gyrofrequencies. This information helps in the identification of the O and X traces, and it provides the starting density of the electron density profile. The inversion of the echo traces into electron density profiles uses the same modified Chebyshev polynomial fitting technique that is successfully applied in the ground-based Digisonde network. The automatic topside ionogram scaler with true height algorithm TOPIST is successfully scaling approx. 70% of the ionograms. An 'editing process' is available to manually scale the more difficult ionograms. The home page for the ISIS project is at http://nssdc.gsfc.nasa.gov/space/isis/isis-status.html. It provides access to as of January 2001, 3000,000 digitized ISIS ionogram data and to related software. A search page lets users select data location, time, and a host of other search criteria. The automated processing of the ISIS ionograms will begin later this year and the electron density profiles will be made available from the project home page. The ISIS data restoration efforts are supported through NASA's Applied Systems and Information Research Program.
Author
Electron Density Profiles; Ionospheric Electron Density; Gyrofrequency; Ionograms; Isis Satellites

20050192506 NASA Goddard Space Flight Center, Greenbelt, MD, USA
CDDIS 2001 Global Data Center Report
Noll, Carey E.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 295-304; In English; See also 20050192500; Original contains black and white illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Crustal Dynamics Data Information System (CDDIS) has supported the International GPS Service (IGS) as a global data center since 1992. The CDDIS activities within the IGS during 2001 are summarized below; this report also includes any changes or enhancements made to the CDDIS during the past year. General CDDIS background and system information can be found in the CDDIS data center summary included in the IGS 1994 Annual Report (Noll, 1995) as well as the subsequent updates (Noll, 1996, Noll, 1997, Noll, 1998, Noll, 1999, and Noll, 2001).
Derived from text
Geodynamics; Global Positioning System; Information Systems; Tectonics; Earth Crust

20050192507 GeoForschungsZentrum, Potsdam, Germany
GFZ Analysis Center of IGS
Gendt, Gerd; Ge, Maorong; Zhang, Fei-Peng; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 59-63; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The changes introduced during 2002 and early 2003 are summarized. They were focused on the improvement in the product quality and in the robustness of the analysis strategy.
Derived from text
Geophysics; Global Positioning System; Data Processing

20050192516 National Oceanic and Atmospheric Administration, Silver Spring, MD, USA
GPS Orbit and Earth Orientation Parameter Production at NOAA for 2002
Kass, William G.; Dulaney, Robert L., III; Leonard, Robert B., Jr.; Mader, Gerald L.; Dillinger, William H.; Ray, Jim; Hilla, Stephen; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 71-75; In English; See also 20050192500; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The GPS orbit and Earth Orientation Parameter (EOP) solutions submitted to the IGS by the National Geodetic Survey (NGS) are a joint effort between the Spacial Reference System Division (SRSD) and the Geosciences Research Division (GRD). The GRD is responsible for the development of the processing software and techniques while the SRSD is responsible for the operational production. SRSD and GRD are both activities within NGS which is part of the National Ocean Service (NOS) of NOAA (National Oceanic and Atmospheric Administration). A detailed description of the techniques and models can be found in the Analysis Strategy Summary located at http://www.ngs.noaa.gov/GPS/noaa_acn.html .
Derived from text
Global Positioning System; Earth Orientation

20050192537 Deutsches Geodaetisches Forschungsinstut, Munich, Germany
IGS RNAAC SIR
Seemueller, Wolfgang; Drewes, Hermann; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 285-290; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since more than six years DGFI is acting as the IGS RNAAC SIR, and provides the weekly coordinate solutions in SINEX format of permanently observing GPS stations in South America and the surrounding area to the IGS global data centers (Seemuller and Drewes, 1997, 1998, 1999, 2000). By using the automated Bernese Processing Engine of the Bernese GPS Software (Rothacher et al., 1996, Hugentobler et al., 2001) all available data in this region are routinely processed on a weekly basis.
Author
Tracking Stations; Global Positioning System

20050192550 Federal Agency for Cartography and Geodesy, Frankfurt, Germany
BKG Regional IGS Data Center Report 2001
Habrich, Heinz; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 307-309; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Federal Agency for Cartography and Geodesy (BKG) operates the Regional IGS Data Center for Europe since the beginning of the IGS Test Campaign in June 21, 1992. GPS tracking data from permanent GPS sites in Europe are obtained from Operational Data Centers (ODC s), Local Data Centers (LDC s), or directly from the stations. Also tracking data from stations outside of Europe are transferred to BKG, if a European institution operates these stations. The received data are uploaded to the Global Data Centers (GDCs), and are also made available to other users. The IGS products as computed by the IGS Analysis Centers are downloaded from the GDC s to BKG in order to provide this information to European users. GPS observation data from the EUREF Permanent GPS Network (EPN) and mixed GPS/GLONASS observation files from the IGEX/IGLOS GLONASS Experiment are also available. A subset of the IGS, EUREF, and IGLOS stations deliver hourly observation files to BKG additionally to the daily files. BKG holds the data files from different projects in separate directories in order to handle the project related restrictions (e.g., the project specific user access). A project independent access is additionally realized through a list of all stations and links to the corresponding subdirectories.
Derived from text
Geodesy; Information Systems; Mapping

20050192563 Raytheon Information Technology and Scientific Services, Greenbelt, MD, USA
International Reference Ionosphere (IRI): Task Force Activity 2000
Bilitza, D.; [2000]; 3 pp.; In English; International Reference Ionosphere (IRI) Task Force Activity 2000, 10-14 Jul. 2000, Trieste, Italy
Contract(s)/Grant(s): NAG5-8145; No Copyright; Avail: CASI; A01, Hardcopy

The annual IRI Task Force Activity was held at the Abdus Salam International Center for Theoretical Physics in Trieste, Italy from July 10 to July 14. The participants included J. Adeniyi (University of Ilorin, Nigeria), D. Bilitza (NSSDC/RITSS, USA), D. Buresova (Institute of Atmospheric Physics, Czech Republic), B. Forte (ICTP, Italy), R. Leitinger (University of Graz, Austria), B. Nava (ICTP, Italy), M. Mosert (University National Tucuman, Argentina), S. Pulinets (IZMIRAN, Russia), S. Radicella (ICTP, Italy), and B. Reinisch (University of Mass. Lowell, USA). The main topic of this Task Force Activity was the modeling of the topside ionosphere and the development of strategies for modeling of ionospheric variability. Each day during the workshop week the team debated a specific modeling problem in the morning during informal presentations and round table discussions of all participants. Ways of resolving the specific modeling problem were devised and tested in the afternoon in front of the computers of the ICTP Aeronomy and Radiopropagation Laboratory using ICTP s computer networks and internet access.
Author
Organizations; Earth Ionosphere

20050192586 Colorado Univ., Boulder, CO, USA
Solar Wind Fluctuations and Their Consequences on the Magnetosphere
Li, Xin-Lin; [2005]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-10474; No Copyright; Avail: CASI; A01, Hardcopy

Efforts have been made to extract the physical meaning of each term in our prediction model of the Dst index using the solar wind as the only input. The work has been published Journal of Geophysical Research (Temerin and Li, 21002). We found different terms in the model representing different current in the magnetospheric system and each current has different rise and decay times, with the symmetric ring current the slowest, then the partial ring current, then the tail current. We also have been trying to understand the physical meaning of the diffusion coefficient used in our prediction model of relativistic electron fluxes at geostationary orbit. The model reproduced the observations of MeV electron flux variations well, the diffusion coefficient had be assumed only die to local magnetic field fluctuations, leading to its 10th power dependence on the L. We have studied the theoretical derivation of the diffusion coefficient and we believe that the effect electric field fluctuations at smaller L could become more significant. We have expanded our previous radiation belt electron prediction model, which predicted MeV electron geosynchronous orbit based on solar wind measurements, to predict MeV electrons inside geosynchronous orbit. The model results are compared with measurements from Polar/CEPPAD. Prediction efficiencies of 0.56 and 0.54, respectively, at L=6 and L=4, have been achieved over the entire year of 1998. This work wa reported at 2003 Fall AGU and has been accepted for publication in Space Weather (Barker et al., 2005). We also have used simultaneous measurements of the upstream solar wind and of energetic electrons at geosynchronous orbit to analyze the response of electrons over a very wide energy range, 50 keV-6MeV, to solar wind variations. Enhancements of energetic electron fluxes over this whole energy range are modulated by the solar wind speed and the polarity of the interplanetary magnetic field (IMF). The solar wind speed seems to be a dominant controlling parameter for electrons of all energy. This work has been published in Space Weather (Li et al., 2005).
Author
Earth Magnetosphere; Mathematical Models; Solar Wind Velocity; Geophysics

20050194578 Massachusetts Univ., Lowell, MA, USA
Automated Processing of ISIS Topside Ionograms into Electron Density Profiles
Reinisch, bodo W.; Huang, Xueqin; Bilitza, Dieter; Hills, H. Kent; [2004]; 38 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-8145; No Copyright; Avail: CASI; A03, Hardcopy

Modeling of the topside ionosphere has for the most part relied on just a few years of data from topside sounder satellites. The widely used Bent et al. (1972) model, for example, is based on only 50,000 Alouette 1 profiles. The International Reference Ionosphere (IRI) (Bilitza, 1990, 2001) uses an analytical description of the graphs and tables provided by Bent et al. (1972). The Alouette 1, 2 and ISIS 1, 2 topside sounder satellites of the sixties and seventies were ahead of their times in terms of the sheer volume of data obtained and in terms of the computer and software requirements for data analysis. As a result, only a small percentage of the collected topside ionograms was converted into electron density profiles. Recently, a

NASA-funded data restoration project has undertaken and is continuing the process of digitizing the Alouette/ISIS ionograms from the analog 7-track tapes. Our project involves the automated processing of these digital ionograms into electron density profiles. The project accomplished a set of important goals that will have a major impact on understanding and modeling of the topside ionosphere: (1) The TOPside Ionogram Scaling and True height inversion (TOPIST) software was developed for the automated scaling and inversion of topside ionograms. (2) The TOPIST software was applied to the over 300,000 ISIS-2 topside ionograms that had been digitized in the fkamework of a separate AISRP project (PI: R.F. Benson). (3) The new TOPIST-produced database of global electron density profiles for the topside ionosphere were made publicly available through NASA s National Space Science Data Center (NSSDC) ftp archive at \hnssdcfkp.gsfc.nasa.gov\g. (4) Earlier Alouette 1,2 and ISIS 1, 2 data sets of electron density profiles from manual scaling of selected sets of ionograms were converted fiom a highly-compressed binary format into a user-friendly ASCII format and made publicly available through nssdcftp.gsfc.nasa.gov. The new database for the topside ionosphere established as a result of this project, has stimulated a multitude of new studies directed towards a better description and prediction of the topside ionosphere. Marinov et al. (2004) developed a new model for the upper ion transition height (Oxygen to Hydrogen and Helium) and Bilitza (2004) deduced a correction term for the I N topside electron density model. Kutiev et al. (2005) used this data to develop a new model for the topside ionosphere scale height (TISH) as a function of month, local time, latitude, longitude and solar flux F10.7. Comparisons by Belehaki et al. (2005) show that TISH is in general agreement with scale heights deduced from ground ionosondes but the model predicts post-midnight and afternoon maxima whereas the ionosonde data show a noon maximum. Webb and Benson (2005) reported on their effort to deduce changes in the plasma temperature and ion composition from changes in the topside electron density profile as recorded by topside sounders. Limitations and possible improvements of the IRI topside model were discussed by Coisson et al. (2005) including also the possible use of the NeQuick model, Our project progressed in close collaboration and coordination with the GSFC team involved in the ISIS digitization effort. The digitization project was highly successful producing a large amount of digital topside ionograms. Several no-cost extensions of the TOPIST project were necessary to keep up with the pace and volume of the digitization effort.
Author
Electron Density Profiles; Ionograms; Isis Satellites; Automatic Control; Earth Ionosphere

20050196071 Air Force Research Lab., Hanscom AFB, MA USA
The 1859 Solar-Terrestrial Disturbance and the Current Limits of Extreme Space Weather Activity
Cliver, E. W.; Svalgaard, L.; Oct. 2004; 17 pp.; In English
Contract(s)/Grant(s): Proj-1010
Report No.(s): AD-A434906; AFRL-VS-HA-TR-2005-1074; No Copyright; Avail: CASI; A03, Hardcopy

It is generally appreciated that the September 1859 solar-terrestrial disturbance, the first recognized space weather event, was exceptionally large. How large and how exceptional? To answer these questions, we compiled rank order lists of the various measures of solar-induced disturbance for events from 1859 to the present. The parameters considered included: magnetic crochet amplitude, solar energetic proton fluence (McCracken et al., 2001a), Sun-Earth disturbance transit time, geomagnetic storm intensity, and low-latitude auroral extent. while the 1859 event has close rivals or superiors in each of the above categories of space weather activity, it is the only documented event of the last ^150 years that appears at or near the top of all of the lists. Taken together, the top-ranking events in each of the disturbance categories comprise a set of benchmarks for extreme space weather activity.
DTIC
Space Weather

20050196111 Boston Coll., Chestnut Hill, MA USA
Stormtime Subauroral Density Troughs: Ion-Molecule Kinetics Effects
Mishin, E. V.; Burke, W. J.; Viggiano, A. A.; Oct. 2004; 10 pp.; In English
Contract(s)/Grant(s): F19628-02-C-0012; Proj-2311
Report No.(s): AD-A434969; AFRL-VS-HA-TR-2005-1073; No Copyright; Avail: CASI; A02, Hardcopy

We report on subauroral plasma density troughs observed by Defense Meteorological Satellite Program (DMSP) satellites during the major magnetic storm of 6 April 2000. The troughs were embedded within strongly irregular, greater than or equal to 500-km wide subauroral convection streams, composed of two distinctive parts. The poleward part coincided with strong wave structures, energetic (ring current) ion precipitations, and enhanced vertical ion flows. One or several narrow density decreases were present here. The equatorward part was marked by a density trough coincident with a local maximum of the electron temperature ^7000-9000 K. Here the ion temperatures and downward vertical ion velocities were ^2000 K and \h20 m/s, respectively. The mean convection velocity was typically less than or equal to 500 m/s. We develop analytical

approximations for the rate coefficients of the charge exchange reactions based on recent laboratory experiments. These have been used in local modeling of the equatorward F peak density depletions. Topside steady-state density profiles were evaluated assuming diffusive equilibrium in a given Te profile. A scenario for the transition of an initial density-height profile to a flat profile is described. Substantial agreement between the modeling results and DMSP observations indicates that the vibrational mechanism contributes significantly to the formation of high-Te-related density troughs.
DTIC
Ions; Kinetics; Magnetospheres; Molecules; Troughs

20050196269 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Atmospheric Turbulence Simulation Using Liquid Crystal Spatial Light Modulators
Phillips, James D.; Mar. 2005; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435239; AFIT/GEO/ENG/05-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

Laser systems are finding a home in many military applications - such as Space Situational Awareness, imaging and weapons systems. With an increasing focus on programs that entail atmospheric propagations, there is a need for a cost effective method of performing proof-of-concept demonstrations. The use of one SLM (single phase screen) to model atmosphere has been investigated previously with promising results. However, some effects cannot be captured with a single SLM. This paper focuses on the addition of a second SLM and quantifying the results. Multiple screens will allow the user to independently control the Fried parameter, the isoplanatic angle, and Rytov Variance. The research is comprised of simulation and experiment. The simulation demonstrates the ability to accurately model atmospheric effects with two phase screens. Based on the simulation, a hardware implementation was tested in the lab. This thesis describes the experimental set-up and results based on measurement of phase and intensity of the propagated field. It was noted that while analytic results are replicated in simulation, similar results in the lab were difficult to achieve.
DTIC
Atmospheric Circulation; Atmospheric Models; Atmospheric Turbulence; Laser Weapons; Light Modulators; Liquid Crystals; Simulation

20050196281 Army Research Lab., Aberdeen Proving Ground, MD USA
Optimization of the NMS6b Weather Model Code
Williamson, Chatt; Thompson, Steven R.; Pressel, Daniel M.; Robinson, Jeffrey N.; Hisley, Dixie; Petit, George; May 2005; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435281; ARL-TR-3496; No Copyright; Avail: Defense Technical Information Center (DTIC)

The U.S. Army needs timely and accurate weather forecasting to support the prediction of battlefield conditions. The U.S. Army Research Laboratory Major Shared Resource Center was tasked with optimizing the Nonhydrostatic Model Simulation (NMS) weather forecasting code for potential U.S. Army use. This code was written for parallel execution on shared memory architectures using OpenMP directives. As written, the code does not run on distributed memory nodes. The NMS code consist of tilde190,000 lines of Fortran code and 4000 lines of C code and was developed by Dr. Greg Tripoli of the University of Wisconsin. The code features a unique variable-stepped topography representation designed to handle steep slopes. It is designed to faithfully represent flows in the presence of arbitrarily rough topography while maintaining sensitivity to subtle impacts of weak topography. In this report, we give a brief description of the NMS code, followed by the initial performance rate and our optimization goal, a short discussion of our approach, an explanation of the optimization work, our final benchmark results, and finally a brief mention of what future work could be done.
DTIC
Atmospheric Models; Coding; Computerized Simulation; Forecasting

20050196654 Hokkaido Univ., Sapporo, Japan
Geophysical Bulletin of Hokkaido University, No. 68
Koyama, Junji; Harimaya, Toshio; Hayashi, Yoshiyuki; Heki, Kosuke; Ikeda, Ryuji; Kasahara, Minoru; Okada, Hiromu; Watanabe, Shigeto; Yomogida, Kiyoshi; March 2005; ISSN 0439-3503; 280 pp.; In English; In Japanese; Original contains color and black and white illustrations; Copyright; Avail: Other Sources

Contents include the following: Observations of Cirrus Cloud by Dual-Wavelength Cloud Radar.Relationship between Micro-pressure Perturbation and Convective Activity Observed in the Orofure Mountain Range in Hokkaido, Japan. Raindrop Size Distributions in NIED Rain Simulator. Evaluation of the Accuracy of Estimation Methods for Raindrop Size Spectra in Microphysical Bulk Parameterization. Influence of Climate Variability over the Northern Hemisphere on Cherry Bloom Date

in Japan. Doppler Radar Observations of Blocked Airflow off the Southeast Coast of the Kii Peninsula in Japan. Gravity Anomaly and Shallow Crustal Structure of the Shimokita Peninsula, Northeastern Japan. The Terrain Density Distribution Inferred from Gravity Inversion in the Ishikari Region, Hokkaido, Japan. Wide-band MT survey on Tarumai volcano, Hokkaido - 2-D Resistivity Analysis.
CASI
Cirrus Clouds; Climate; Density Distribution; Doppler Radar

20050196688 Colorado Univ., Boulder, CO, USA
Onset of Convection in Ice I with Composite Newtonian and Non-Newtonian Rheology: Application to the Icy Galilean Satellites
Barr, A. C.; Pappalardo, R. T.; Journal of Geophysical Research; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NCC2-1340; No Copyright; Avail: Other Sources; Abstract Only

Ice I exhibits a complex rheology at temperature and pressure conditions appropriate for the interiors of the ice I shells of Europa, Ganymede, and Callisto. We use numerical methods and existing parameterizations of the critical Rayleigh number to determine the conditions required to trigger convection in an ice I shell with the stress-, temperature- and grain size-dependent rheology measured in laboratory experiments by Goldsby and Kohlstedt [2001]. The critical Rayleigh number depends on the ice grain size and the amplitude and wavelength of temperature perturbation issued to an initially conductive ice I shell. If the shells have an assumed uniform grain size less than 0.4 mm, deformation during initial plume growth is accommodated by Newtonian volume diffusion. If the ice grain size is between 0.4 mm and 3 cm, deformation during plume growth is accommodated by weakly non-Newtonian grain boundary sliding, where the critical ice shell thickness for convection depends on the amplitude of temperature perturbation to the _0.5 power. If the ice grain size exceeds 2 cm, convection can not occur in the ice I shells of the Galilean satellites regardless of the amplitude or wavelength of temperature perturbation. If the grain size in a convecting ice I shell evolves to effective values greater than 2 cm, convection will cease. If the ice shell has a grain size large enough to permit flow by dislocation creep, the ice is too stiff to permit convection, even in the thickest possible ice I shell. Consideration of the composite rheology implies that estimates of the grain size in the satellites and knowledge of their initial thermal states are required when judging the convective instability of their ice I shells.
Author
Galilean Satellites; Icy Satellites; Numerical Analysis; Parameterization; Rheology; Convection; Newtonian Fluids; Nonnewtonian Fluids

20050196707 Raytheon Information Technology and Scientific Services, Greenbelt, MD, USA
A Correction for the IRI Topside Electron Density Model Based on Alouette/ISIS Topside Sounder Data
Bilitza, D.; Advances in Space Research; 2004; ISSN 0273-1177; Volume 33, pp. 838-843; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-8145; NSF ATM-97-13469; NSF INT-00-02144; Copyright; Avail: Other Sources

The topside segment of the International Reference Ionosphere (IRI) electron density model (and also of the Bent model) is based on the limited amount of topside data available at the time (40,OOO Alouette 1 profiles). Being established from such a small database it is therefore not surprising that the models have well-known shortcomings, for example, at high solar activities. Meanwhile a large data base of close to 200,000 topside profiles from Alouette 1,2, and ISIS I, 2 has become available online. A program of automated scaling and inversion of a large volume of digitized ionograms adds continuously to this data pool. We have used the currently available ISIs/Alouette topside profiles to evaluate the IRI topside model and to investigate ways of improving the model. The IRI model performs generally well at middle latitudes and shows discrepancies at low and high latitudes and these discrepancies are largest during high solar activity. In the upper topside IRI consistently overestimates the measurements. Based on averages of the data-model ratios we have established correction factors for the IRI model. These factors vary with altitude, modified dip latitude, and local time.
Author
Alouette Project; Alouette 1 Satellite; Earth Ionosphere; Isis Satellites

20050196710 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Electron Density Profiles of the Topside Ionosphere
Huang, Xue-Qin; Reinsch, Bodo W.; Bilitza, Dieter; Benson, Robert F.; Annals of Geophysics; February 2002; Volume 45, No. 1, pp. 125-130; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-8145; RTOP 370-03-00-04; Copyright; Avail: Other Sources

The existing uncertainties about the electron density profiles in the topside ionosphere, i.e., in the height region from h,F2 to - 2000 km, require the search for new data sources. The ISIS and Alouette topside sounder satellites from the sixties to the eighties recorded millions of ionograms but most were not analyzed in terms of electron density profiles. In recent years an effort started to digitize the analog recordings to prepare the ionograms for computerized analysis. As of November 2001 about 350000 ionograms have been digitized from the original 7-track analog tapes. These data are available in binary and CDF format from the anonymous ftp site of the National Space Science Data Center. A search site and browse capabilities on CDAWeb assist the scientific usage of these data. All information and access links can be found at http://nssdc.gsfc.nasa.gov/space/isis/isis- status.htm1. This paper describes the ISIS data restoration effort and shows how the digital ionograms are automatically processed into electron density profiles from satellite orbit altitude (1400 km for ISIS-2) down to the F peak. Because of the large volume of data an automated processing algorithm is imperative. The TOPside Ionogram Scaler with True height algorithm TOPIST software developed for this task is successfully scaling - 70% of the ionograms. An \h\hediting process\g\g is available to manually scale the more difficult ionograms. The automated processing of the digitized ISIS ionograms is now underway, producing a much-needed database of topside electron density profiles for ionospheric modeling covering more than one solar cycle.
Author
Ionospheres; Electron Density Profiles

20050196713 Ohio State Univ., Columbus, OH, USA
Coupled Gravity and Elevation Measurements of Ice Sheet Mass Change
Jezek, K. C.; July 05, 2005; 26 pp.; In English
Contract(s)/Grant(s): NNG04GL66G; No Copyright; Avail: CASI; A03, Hardcopy

We measured surface gravity and position at ten locations about two glaciological measurement networks located on the South-central Greenland Ice during June 2004. Six of the individual sites of the first network were occupied the previous year. At the repeat sites we were able to measure annual accumulation rate and surface displacement by referencing measurements to aluminum poles left in the firn the previous year. We occupied 4 additional sites at a second measurement network for the first time since initial observations were last made at the network in 1981. At each individual site, we operated a GPS unit for 90 minutes - the unit was operated simultaneously with a base station unit in Sondrestrom Fjord so as to enable differential, post-processing of the data. We installed an aluminum, accumulation-rate-pole at each site. The base section of the pole also served as the mount for the GPS antenna. A new, Scintrex gravimeter was used at each site and relative gravity measurements were tied to the network of absolute gravity stations in Sondrestrom. We measured snow physical properties in two shallow pits. This report summarizes our observations and data analysis.
Author
Ice; Snow; Glaciology

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20050188615 Space and Naval Warfare Systems Center, San Diego, CA USA
Advanced Refractive Effects Prediction System (AREPS)
Patterson, Wayne L.; Aug. 2001; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434242; No Copyright; Avail: CASI; A02, Hardcopy

In 1987, SSC San Diego fielded the Integrated Refractive Effects Prediction System (IREPS), the world's first electromagnetic prediction system for shipboard use. Advances in research and technology have led to the replacement of IREPS with the Advanced Refractive Effects Prediction System (AREPS). AREPS computes and displays radar probability of detection, propagation loss and signal-to-noise ratios, electronic-support-measures vulnerability, UHF/VHF communications, and surface-borne surface-search radar capability versus range, height, and bearing from the transmitter.
DTIC
Atmospheric Refraction; Computer Programs; Electromagnetic Interference; Electromagnetic Wave Transmission; Prediction Analysis Techniques; Refractivity

20050188629 Joint Chiefs of Staff, Washington, DC USA

Joint Doctrine, Tactics, Techniques, and Procedures for Meteorological and Oceanographic Operations

Mar. 1999; 112 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434264; JCS-PUB-3-59; No Copyright; Avail: CASI; A06, Hardcopy

This publication has been prepared under the direction of the Chairman of the Joint Chiefs of Staff. It sets forth doctrine and selected joint tactics, techniques, and procedures (JTTP) to govern the joint activities and performance of the Armed Forces of the USA in joint operations and provides the doctrinal basis for US military involvement in multinational and interagency operations. It provides military guidance for the exercise of authority by combatant commanders and other joint force commanders and prescribes doctrine and selected tactics, techniques, and procedures for joint operations and training. It provides military guidance for use by the Armed Forces in preparing their appropriate plans. It is not the intent of this publication to restrict the authority of the joint force commander (JFC) from organizing the force and executing the mission in a manner the JFC deems most appropriate to ensure unity of effort in the accomplishment of the overall mission.

DTIC

Meteorological Parameters; Military Operations; Oceanography; Tactics

20050188636 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

In-line Particulate Transport and Dispersion Modeling Using the Regional Atmospheric Modeling System (RAMS)

Englert, John W.; Mar. 2005; 83 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434272; AFIT/GNE/ENP/05-03; No Copyright; Avail: CASI; A05, Hardcopy

There are a number of analytical and semi-empirical models that describe the behavior of particulate matter in the atmosphere. Many of these require modification for all types of weather, dry versus wet deposition, and overall effects can be quite non-linear. Rainfall (rate, drop size, etc.), snowfall (rate, flake size, etc.), humidity, pressure, temperature, and combination of these greatly affect particle settling and washout rates. To that end, a method for tracking released constituents using the Regional Atmospheric Modeling System (RAMS) microphysics package is developed by modifying one of the hydrometeor categories (hail) in the microphysics package. The RAMS microphysics package allows the investigator to change the formulation of the parameterization scheme of the model for different applications, such as a regional-scale numerical study versus a small continental cumulus simulation. In this study, four test simulations are conducted, two with precipitation and two during dry conditions, each with two different mean particle sizes. Modified RAMS simulations using the larger mean particle size have similar deposition patterns to the Hazard Prediction and Assessment Capability (HPAC) version 4.04 simulations using location time and meteorological data. Advantages to using RAMS for particulate tracking as opposed to using a non-forecasting dispersion model include more realistic plume and fallout patterns and continuous feedback into the numerical forecast of the tracked particulate effects.

DTIC

Atmospheric Models; Particulates

20050188709 Agency for Healthcare Research and Quality, Rockville, MD USA

Lessons in Safety Climate and Safety Practices from a California Hospital Consortium

Singer, Sara J.; Dunham, Kelly M.; Bowen, Jennie D.; Geppert, Jeffrey J.; Gaba, David M.; McDonald, Kathryn M.; Baker, Laurence C.; May 2005; 14 pp.; In English

Report No.(s): AD-A434375; No Copyright; Avail: CASI; A03, Hardcopy

The Patient Safety Consortium included a group of 26 diverse hospitals in or near California. In 2001 and 2002, many consortium hospitals were surveyed using the Patient Safety Climate in Healthcare Organizations (PSCHO) tool to present quantitative measures of hospital safety climate and qualitative reports on safety practices over 2 years. Investigators engaged in discussions with consortium hospitals to elicit reports about their patient safety activities. Overall quantitative measures of safety climate remained approximately the same over the 2 years, although in some specific survey areas climate appeared to improve. Hospitals reported a range and mix of patient safety activities. While considered an essential enabler of safety, cultural change takes time. Significant hospital efforts appear to be underway, and attention to a number of lessons from past patient safety efforts may benefit future undertakings.

DTIC

Climate; Hospitals; Management Systems; Medical Services; Organizations; Procedures; Safety

20050192465 Georgia Tech Research Inst., Atlanta, GA, USA
Simulation of Aerosols and Chemistry with a Unified Global Model
Chin, Mian; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NAG5-13462
Report No.(s): G-35-B58; No Copyright; Avail: Other Sources; Abstract Only

This project is to continue the development of the global simulation capabilities of tropospheric and stratospheric chemistry and aerosols in a unified global model. This is a part of our overall investigation of aerosol-chemistry-climate interaction. In the past year, we have enabled the tropospheric chemistry simulations based on the GEOS-CHEM model, and added stratospheric chemical reactions into the GEOS-CHEM such that a globally unified troposphere-stratosphere chemistry and transport can be simulated consistently without any simplifications. The tropospheric chemical mechanism in the GEOS-CHEM includes 80 species and 150 reactions. 24 tracers are transported, including O3, NOx, total nitrogen (NOy), H2O2, CO, and several types of hydrocarbon. The chemical solver used in the GEOS-CHEM model is a highly accurate sparse-matrix vectorized Gear solver (SMVGEAR). The stratospheric chemical mechanism includes an additional approximately 100 reactions and photolysis processes. Because of the large number of total chemical reactions and photolysis processes and very different photochemical regimes involved in the unified simulation, the model demands significant computer resources that are currently not practical. Therefore, several improvements will be taken, such as massive parallelization, code optimization, or selecting a faster solver. We have also continued aerosol simulation (including sulfate, dust, black carbon, organic carbon, and sea-salt) in the global model to cover most of year 2002. These results have been made available to many groups worldwide and accessible from the website http://code916.gsfc.nasa.gov/People/Chin/aot.html.
Author (revised)
Aerosols; Atmospheric Chemistry; Atmospheric Models; Troposphere; Stratosphere

20050192467 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Satellite Ecohydrology and Multifractals: Perspectives for Understanding and Dealing with Greenhouse Gas Emissions from Hydroreservoirs
TavaresdeLima, Ivan Gergier; 2005; 23 pp.; In English; Original contains color and black and white illustrations
Report No.(s): INPE-12567-RPQ/797; No Copyright; Avail: CASI; A03, Hardcopy

The present article characterizes a first attempt to identify scientific branches that together may assign technical solutions to better understand and deal with greenhouse gas emissions from hydroreservoirs in Brazil. The concepts of Ecohydrology are described in the first section. In the following is provided an ecohydrologic approach by using automated data acquisition systems to evaluate evidences of rainy fronts acting upon bubble methane releases and carbon dioxide fluxes. Finally, it is shown a Multifiactal Detrended Fluctuation Analysis (MFDFA) of greenhouse gas fluxes at the water-air interface of hydroreservoirs as a direction for future long term simulations.
Author
Gas Spectroscopy; Greenhouse Effect; Emission Spectra; Automatic Control; Carbon Dioxide; Exhaust Emission

20050192477 California Univ., Santa Barbara, CA, USA
[Multi-Scale Convergence of Cold-Land Process Representation in Land-Surface Models, Microwave Remote Sensing, and Field Observations]
Shi, Jiancheng; [2005]; 12 pp.; In English
Contract(s)/Grant(s): NAG51 1709; No Copyright; Avail: CASI; A03, Hardcopy

The cryosphere is a major component of the hydrosphere and interacts significantly with the global climate system, the geosphere, and the biosphere. Measurement of the amount of water stored in the snow pack and forecasting the rate of melt are thus essential for managing water supply and flood control systems. Snow hydrologists are confronted with the dual problems of estimating both the quantity of water held by seasonal snow packs and time of snow melt. Monitoring these snow parameters is essential for one of the objectives of the Earth Science Enterprise-understanding of the global hydrologic cycle. Measuring spatially distributed snow properties, such as snow water equivalence (SWE) and wetness, from space is a key component for improvement of our understanding of coupled atmosphere-surface processes. Through the GWEC project, we have significantly advanced our understandings and improved modeling capabilities of the microwave signatures in response to snow and underground properties.
Derived from text
Cryospheres; Biosphere; Earth Hydrosphere; Climatology; Lithosphere; Hydrological Cycle

20050192478 Massachusetts Inst. of Tech., Cambridge, MA, USA
Linking Urban Air Pollution to Global Tropospheric Chemistry and Climate
Wang, Chien; [2005]; 2 pp.; In English
Contract(s)/Grant(s): NNG04GP30G; No Copyright; Avail: CASI; A01, Hardcopy

The two major tasks of this project are to study: (a) the impact of urban nonlinear chemistry on chemical budgets of key pollutants in non-urban areas; and (b) the influence of air pollution control strategies in selected metropolitan areas, particularly of emerging economies in East and South Asia, on tropospheric chemistry and hence on regional and global climate.
Derived from text
Air Pollution; Atmospheric Chemistry; Cities; Climate Models; Troposphere

20050192541 European Space Agency. European Space Operations Center, Darmstadt, Germany
2001 IGS Activities in the Area of the Ionosphere
Feltens, J.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 345-354; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The IGS Ionosphere Working Group (Iono_WG) is active since June 1998. The working group's most important short-term goal is the routine provision of global ionosphere Total Electron Content (TEC) maps plus differential code biases (DCBs) with a delay of some days. In the year 2001, to which this Technical Report is dedicated to, the delivery of DCBs was restricted only to those of the GPS satellites. At the time when this Technical Report was written in August 2002, the routine delivery of station DCBs was implemented too. In the medium- and long-term, the working group intends to develop more sophisticated algorithms for deducing mappings of ionospheric parameters from GPS measurements and to realize near-real-time availability of IGS ionosphere products. The final target is the establishment of an independent IGS ionosphere model.
Derived from text
Algorithms; Global Positioning System; Electron Density (Concentration); Real Time Operation

20050194638 Harvard Univ., Cambridge, MA, USA
Economic and Energy Development in China: Policy Options and Implications for Climate Change. Final Report, September 1, 1995-May 14, 2002
McElroy, M. B.; Jan. 2003; 18 pp.; In English
Report No.(s): DE2005-834528; No Copyright; Avail: Department of Energy Information Bridge

The Harvard University Center for the Environment and partner institutions in China established a multidisciplinary program of integrated research on energy-related environmental issues, local air pollution and global climate change, in China and their role in U.S.-Chinese relations. Major research streams included: (a) developing a dynamic, multi-sector model of the Chinese economy that can estimate energy use, emission, and health damages from pollution, and using this model to simulate broad economic effects of market-based pollution-control policies; (b) developing a regionally disaggregated model of technology and investment choice in the Chinese electric power sector; (c) applying an atmospheric chemical tracer transport model to investigate carbon uptake in Eurasis (notably China) and North America, and to inform observational strategies for CO(sub 2) in China and elsewhere.
NTIS
Air Pollution; Carbon; China; Climate Change; Economic Development; Energy Policy; Environment Management

20050194680 Lawrence Livermore National Lab., Livermore, CA USA
Climate Model Output Rewriter (CMOR)
Taylor, K. E.; Doutriaux, C.; Peterschmitt, J. Y.; Jun. 10, 2004; 36 pp.; In English
Report No.(s): DE2005-15014202; UCRL-TR-204637; No Copyright; Avail: Department of Energy Information Bridge

This document describes a software library called 'Climate Model Output Rewriter' (CMOR), which comprises a set of FORTRAN 90 functions that can be used to produce CF-compliant netCDF files. The structure of the files created by CMOR and the metadata they contain fulfill the requirements of many of the climate community's standard model experiments (which are referred to here as 'MIPs' and include, for example, AMIP, CMIP, CFMIP, PMIP, APE, and IPCC scenario runs).
NTIS
Climate; Climate Models; Computer Programs

20050194717 Colorado Univ., Boulder, CO, USA

Influence of Nucleation Mechanisms on the Radiative Properties of Deep Convective Clouds and Subvisible Cirrus in CRYSTAL/FACE

Toon, Owen B.; [2005]; 4 pp.; In English

Contract(s)/Grant(s): NAG5-11474; No Copyright; Avail: CASI; A01, Hardcopy

During the past few years we have conducted work on several different topics, as reflected by our publications. As one of the Co-Project scientists for The Cirrus Regional Study of Tropical Anvils and Cirrus Layers - Florida Area Cirrus Experiment (CRYSTAL FACE) we worked to help design the mission and then conduct it in the field. Another major activity during the past two years has been to pull together various groups to formulate plans for follow on missions to CRYSTAL FACE. We organized a workshop at the University of Colorado during the summer of 2003 to assess the best locations for future missions. Working with a group of about 10 scientists from around the country we prepared a science-planning document (Tropical Composition, Cloud and Climate Coupling Experiment (TC(sup 4)) that outlined the rationale, locations, strategy to accomplish the goals, and possible payloads for a set of three tropical missions. We also prepared background materials for various NRAs being prepared at NASA Headquarters for missions in Costa Rica, Darwin and Guam. In conjunction with the group at NASA Ames we have helped build a new numerical model for deep convection and have applied that model to simulate the CRYSTAL data. Our goal in particular has been to better understand how convection distributes water vapor isotopes. CRYSTAL observations of water isotopes are very different from those suggested by previous workers who assumed the isotopes would obey Rayleigh fractionation. The water isotope study has several implications. First it is a check on the realism of the deep convection model. Second, the isotopes are a measure of the precipitation removal in the atmosphere. Hence they provide a constraint on a parameter that is difficult to otherwise measure. Finally it has been suggested that isotopes may be the key to unraveling the water transport into the stratosphere and upper troposphere. Such transport is critical both for the radiation balance and for stratospheric chemistry. Ours is the first model that is able to treat this transport. Our initial results have just been submitted to Geophys. Res. Lett (Smith et al., 2005). Essentially we are able to explain the vertical profiles of isotopes in the tropical tropopause transition layer. We are also able to account for stratospheric humidity and isotope abundances with this model. We have also been heavily involved in trying to improve our understanding of nitric acid condensation on ice. Gao et al (2004) have shown that water supersaturations above ice occur when the atmosphere is supersaturated with respect to nitric acid trihydrate. As one of the co-authors of that work, we suggested the mechanism that may explain why this is occurring. Essentially, ice does not like to grow near unit supersaturation, but does so because the water molecules can find sites on the ice surface to attach themselves to before they fly off the ice surface. This phenomena was well known in the 1960s when it was a source of debate about whether condensation and evaporation coefficients for ice would be the same. Evaporation does not require any molecular orientation, while condensation does, so it was possible that the coefficients would differ. They don't differ because the water molecules rapidly move across the surface and find places to attach. Nitric acid may be occupying these preferred sites and therefore the water molecules can't find a desirable place to attach. We anticipate that this research will be the subject of laboratory work during the coming few years. Another possibility that has been suggested is that cubic ice is forming in clouds. We have measured the vapor pressure of cubic ice, and plan to publish that result in the next few months. We have also been working on additional aspects of the condensation of nitric acid on ice. With Y. Kondo we studied the condensation of NOy on ice using the SOLVE data. Gamblin et al. have continued this work. The CRYSTAL NOy and HNO, groups have shown th their data can be fit using standard Langmuir isotherms as suggested in some, but not all, laboratory studies. We have found in the SOLVE data set that this is not the case. Moreover some laboratory studies show there are important kinetic effects that may be occurring in the atmosphere limiting the transfer of nitric acid to the ice. The SOLVE data seem consistent with these studies. We are currently re-analyzing the CRYSTAL data to look for these kinetic effects. There are a number of implications of these studies. One of the more interesting is that the nitric acid coating on ice can be used as a cloud clock to determine how long the cloud parcel has been in existence. We have also been involved with several laboratory studies. We have worked to improve the database on ice optical constants, which are critical for remote sensing. We have also studied the ways in which ice nucleates on clays. We suspect now that the standard theories used for depositional ice nucleation are completely incorrect. Further work will be needed to develop a new theory.

Derived from text

Nitric Acid; Nucleation; Supersaturation; Condensation Nuclei; Cirrus Clouds; Dust; Ice; Radiative Transfer

20050195825 Colorado Univ., Boulder, CO, USA

Theoretical Investigations of Clouds and Aerosols in the Stratosphere and Upper Troposphere

Toon, Owen B.; July 13, 2005; 4 pp.; In English

Contract(s)/Grant(s): NAG5-11243; No Copyright; Avail: CASI; A01, Hardcopy

support of the Atmospheric Chemistry Modeling and Data Analysis Program. We investigated a wide variety of issues involving ambient stratospheric aerosols, polar stratospheric clouds or heterogeneous chemistry, analysis of laboratory data, and particles in the upper troposphere. The papers resulting from these studies are listed below. In addition, I participated in the 1999-2000 SOLVE mission as one of the project scientists and in the 2002 CRYSTAL field mission as one of the project scientists. Several CU graduate students and research associates also participated in these mission, under support from the ACMAP program, and worked to interpret data. During the past few years my group has completed a number of projects under the

Author

Numerical Analysis; Ice Clouds; Aerosols; Stratosphere; Troposphere

20050195962 Agency for Healthcare Research and Quality, Rockville, MD USA

Safety Climate on Hospital Units: A New Measure

Blegen, Mary A.; Pepper, Ginette A.; Rosse, Joseph; Jan. 2005; 16 pp.; In English

Report No.(s): AD-A434740; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this project was to create a measure of safety climate for hospital inpatient care units and to determine the psychometric properties of the measure. Methods: The first version of the measure was derived from published literature. Two rounds of expert review refined that measure. The measure was then pilot tested with 213 RN staff nurses working on 19 units in two hospitals, and administered a second time in one of those hospitals. Results: The Hospital Unit Safety Climate measure contains 33 items measuring 7 dimensions of safety climate. Internal consistency reliability was acceptable for the new measure. This measure has content validity and initial construct validity as indicated by factor analysis and comparative analysis. Early evidence suggests sensitivity and responsiveness. Conclusions: This safety climate measure is a strong alternative to the tools currently available for projects focusing on safety in inpatient units in acute care hospitals. The measure is being used in a national sample of hospitals participating in a study of the working conditions that affect medication accuracy.

DTIC

Climate; Hospitals; Safety

20050195963 Agency for Healthcare Research and Quality, Rockville, MD USA

On-Line Patient Safety Climate Survey: Tool Development and Lessons Learned

Connelly, Lynne M.; Powers, Judy L.; Jan. 2005; 15 pp.; In English

Report No.(s): AD-A434743; No Copyright; Avail: Defense Technical Information Center (DTIC)

A key tenet of patient safety programs is the elimination of the 'culture of blame.' The On-line Patient Safety Climate Survey was developed to evaluate the corporate safety climate of the U.S. Army Medical Department (AMEDD). The survey tool was designed to measure willingness to report errors, problem-solving processes, and perceptions of the leadership's concern for patient safety. The survey included two demographic questions, 19 items using a 4-point Likert scale (1 = strongly disagree to 4 = strongly agree), and one text item that asked respondents to identify the number one safety issue at their facility. After the instrument was tested to evaluate its psychometric properties, it was administered at 37 military hospitals and clinics in an effort to establish a systemwide baseline. In 2001, staff at 37 medical treatment facilities (MTFs) participated in the survey (N = 10,769). The overall systemwide score (all respondents) was positive (2.96), and analyses of specific items demonstrated that error reporting was an area of concern. The OnLine Patient Safety Survey demonstrated adequate psychometric properties and the ability to provide an accurate assessment of the overall safety climate across the various clinical treatment facilities of an organized health care system. The results provided information useful for establishing a corporate baseline and identifying specific quality improvement needs.

DTIC

Climate; Health; On-Line Systems; Patients; Safety

20050196057 Army Engineer Research and Development Center, Vicksburg, MS USA

Description of the Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) and Application to Watershed Studies

Fleming, Matt; Sep. 2004; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434887; ERDC/TN SMART-04-3; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this document is to describe the Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) program and its applications to watershed studies. HMS has the capability to serve as a cornerstone program with

respect to the watershed perspective approach. HMS can simulate the rainfall-runoff at any point within a watershed given physical characteristics of the watershed. It is a tool for watershed management in that an HMS model can be developed to account for human impact to determine the effect on the magnitude, quantity, and timing of runoff at points of interest. Results from an HMS model can be used by a number of other programs to determine impact in areas such as water quality and flood damage.
DTIC
Drainage; Hydrology Models; Rain; Simulation; Watersheds

20050196744 National Severe Storms Lab., Norman, OK, USA
Use of Moisture Flux Convergence in Forecasting Convective Initiation: Historical and Operational Perspectives
Banacos, P. C.; Schultz, D. M.; Dec. 21, 2004; 52 pp.; In English
Report No.(s): PB2005-108362; No Copyright; Avail: CASI; A04, Hardcopy

Moisture flux convergence (MFC) is a term in the conservation of water vapor equation and was first calculated in the 1950s and 1960s as a vertically integrated quantity to predict rainfall associated with synoptic-scale systems. Vertically integrated MFC was also incorporated into the Kuo cumulus parameterization scheme for the Tropics. MFC was eventually suggested for use in forecasting convective initiation in the midlatitudes in 1970, but practical MFC usage quickly evolved to include only surface data, owing to the higher spatial and temporal resolution of surface observations. Since then, surface MFC has been widely applied as a short-term prognostic quantity for forecasting convective initiation, with an emphasis on determining the favorable spatial location(s) for such development.
NTIS
Atmospheric Models; Convection; Convergence; Forecasting; Histories; Moisture

20050196746 Bureau of Reclamation, Denver, CO, USA, National Center for Atmospheric Research, Boulder, CO USA
CCOP Data Inventory, 1981: Cooperative Convective Precipitation Experiment
Feb. 1982; 460 pp.; In English
Report No.(s): PB2005-106530; No Copyright; Avail: CASI; A20, Hardcopy

During the summer of 1981, a joint field experiment in atmospheric research was conducted by the Bureau of Reclamation and the National Center for Atmospheric Research. It was aimed at answering many questions related to precipitation from convective storms. This experiment was titled Cooperative Convective Precipitation Experiment, commonly referred to as CCOPE. The field site was at Miles City, Montana, where the Bureau has had an ongoing experiment since 1975. Involved in the program were other Federal agencies, numerous universities, and private organizations active in atmospheric research. After its inception, CCOPE evolved into a program of international interest with persons from Canada, England, Switzerland, and Italy participating. This document contains a complete inventory of all data collected in association with CCOPE during the 1981 field season. It is intended to be a primary aid to researchers by helping them acquire the necessary data for their particular analysis.
NTIS
Convection; Data Acquisition; Inventories; Precipitation (Meteorology)

20050196762 National Centers for Environmental Prediction, Silver Spring, MD USA
Hurricane Fran, August 28-September 8, 1996. Service Assessment
Jul. 1997; 56 pp.; In English
Report No.(s): PB2005-108220; No Copyright; Avail: CASI; A04, Hardcopy

Fran was a category 3 hurricane on the Saffir-Simpson Hurricane Scale (see Appendix A) when it made landfall on the North Carolina coast near Cape Fear on September 5, 1996. Besides sustained winds of 115 miles per hour (mph), the storm surge and high water marks to nearly 13 feet in some coastal areas of North Carolina and Virginia exceeded those of Hurricane Hazel in 1954, although Hazel was a category 4 storm. Heavy rains created extensive inland flooding from the Carolinas into Virginia, West Virginia, and Pennsylvania. Additionally, strong inland winds created severe damage and power outages with hurricane-force wind gusts extending to near Raleigh, North Carolina. Hurricane Fran was directly responsible for 26 deaths. Widespread 5- to 10-inch amounts of rain were recorded over the Middle Atlantic region with 14 to nearly 16 inches in parts of Virginia and West Virginia. The rains brought many rivers in North Carolina, Virginia, and central Pennsylvania to, or above, flood stage. Particularly hard hit were Virginia and North Carolina, where record or near-record river levels occurred at many gage sites. Fran was the worst recorded natural economic disaster ever to occur in North Carolina. Nearly a half-million tourists and residents were evacuated from the coasts of North and South Carolina. Press reports from Reuters

News Service stated that 4.5 million people in the Carolinas and Virginia were left without power.
NTIS
Forecasting; Hurricanes; Storms; Disasters; Damage

20050196763 National Centers for Environmental Prediction, Silver Spring, MD USA
Hurricane Bertha, July 5-14, 1996. Service Assessment
Apr. 1997; 74 pp.; In English
Report No.(s): PB2005-108215; No Copyright; Avail: CASI; A04, Hardcopy

Hurricane Bertha was an early season Category 2 storm when it made landfall on the coast of North Carolina on July 12, 1996. Twelve deaths have been directly attributed to Bertha with USA damages estimated at $270 million. Extensive evacuations of vulnerable areas occurred in advance of Bertha, including 250,000 in North Carolina, 80,000 in South Carolina and 20,000 in Georgia. Revenue losses to the tourist industry approached $40 million. Bertha closely paralleled the southeast U.S. coast at a distance from 170 to 200 miles. This created multiple state involvement with almost all of the U.S. east coast involved with some watch or warning. The NHCs track forecast was very accurate with average forecast track errors 15 percent lower than the 10-year official track averages. Where the storm came ashore in North Carolina, watches and warnings were posted 65 hours and 47 hours before landfall, respectively, which far exceeds the NHC stated goals of 36 and 24 hours. Nevertheless, the coordination between NHC and emergency managers, regarding the issuances of watches and warnings, was frustrated by efforts to reconcile the meteorology of the event with state and local response requirements. Berthas anticipated turn from a northwest direction to north-northwest as it approached the southeast coast was agonizingly slow. This put a great deal of pressure on the elected officials and Emergency Management Centers (EMCs) of Florida, South Carolina and North Carolina concerning what actions to take. This was also the first time the HLT had been fully deployed at the NHC. A Service Assessment Team was dispatched to the NHC as well as the impacted states to investigate these issues and to evaluate the HLT. Issues Berthas slow northward turn off the Florida coast caused the state of Florida to urge NHC to issue watches when NHC felt they were unnecessary. The major concern was that if the storm continued to move differently than forecast, sufficient response time would not be available if watches or warnings were issued at short notice. Similarly, South Carolina expressed the need for early release of the official forecast track before NHC had completed the internal NWS coordination process. Several recommendations have been made in this report to help resolve these issues.
NTIS
Forecasting; Hurricanes; Meteorology; Storms

20050196764 Fire Administration, Washington, DC, USA
Lightning Fires. U.S. Fire Administration Topical Fire Research Series, Volume 2, Issue 6, August 2001 (Rev. March 2002)
Mar. 2002; 8 pp.; In English
Report No.(s): PB2005-107984; No Copyright; Avail: CASI; A02, Hardcopy

Each year, an estimated 17,400 fires are attributed to lightning. Annually, these fires result in approximately 10 civilian deaths, 75 civilian injuries, and $138 million in property damage. (The casualties described are those that result from fires caused by lightning, not those that result from direct lightning strikes.) Casualty losses per lightning fire are considerably less than those from all U.S. fires, but the dollar loss per fire is nearly twice as high. This topical report presents an overview of some characteristics of these naturally occurring fires.
NTIS
Fires; Lightning

20050196802 National Centers for Environmental Prediction, Silver Spring, MD USA
Hurricane Hugo, September 10-22, 1989. Natural Disaster Survey Report
May 1990; 88 pp.; In English
Report No.(s): PB2005-108361; No Copyright; Avail: CASI; A05, Hardcopy

NOAA pronounced 1989's Hurricane Hugo as the strongest storm to strike the USA in 20 years. The NWS, through its National Hurricane Center (NHC), reported that Hugo smashed into the Charleston, South Carolina, area minutes before midnight, September 22, with winds estimated at 135 MPH in Bulls Bay north of the city. Four days earlier, the storm crossed the U.S. Virgin Islands and Puerto Rico with equal force. This document presents a summary of Hugo's recorded and estimated surface wind speeds. The hurricane was the Nation's costliest in terms of monetary losses but not in lives lost. Forty-nine directly-related storm fatalities were recorded, 26 in the U.S and its Caribbean islands. Twenty-three died in other

Leeward Islands. NHC estimated more than $9 billion in damages and economic losses on the mainland, Puerto Rico and the Virgin Islands. The mainland alone accounted for $7 billion of the total.
NTIS
Disasters; Hurricanes; Storms; Surveys

20050198882 Pennsylvania State Univ., University Park, PA, USA
Chemical Modeling for Studies of GeoTRACE Capabilities
[2005]; 8 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-12426; No Copyright; Avail: CASI; A02, Hardcopy

Geostationary measurements of tropospheric pollutants with high spatial and temporal resolution will revolutionize the understanding and predictions of the chemically linked global pollutants aerosols and ozone. However, the capabilities of proposed geostationary instruments, particularly GeoTRACE, have not been thoroughly studied with model simulations. Such model simulations are important to answer the questions and allay the concerns that have been expressed in the atmospheric sciences community about the feasibility of such measurements. We proposed a suite of chemical transport model simulations using the EPA Models 3 chemical transport model, which obtains its meteorology from the MM-5 mesoscale model. The model output consists of gridded abundances of chemical pollutants and meteorological parameters every 30-60 minutes for cases that have occurred in the Eastern USA. This output was intended to be used to test the GeoTRACE capability to retrieve the tropospheric columns of these pollutants.
Author
Aerosols; Temporal Resolution; Troposphere; Ozone; Meteorological Parameters; Atmospheric Chemistry; Contaminants; Global Air Pollution; Spatial Resolution

20050199049 Hampton Univ., VA, USA
Contrail Tracking and ARM Data Product Development
Duda, David P.; Russell, James, III; June 2005; 21 pp.; In English
Contract(s)/Grant(s): NAG1-02044; No Copyright; Avail: CASI; A03, Hardcopy

A contrail tracking system was developed to help in the assessment of the effect of commercial jet contrails on the Earth's radiative budget. The tracking system was built by combining meteorological data from the Rapid Update Cycle (RUC) numerical weather prediction model with commercial air traffic flight track data and satellite imagery. A statistical contrail-forecasting model was created a combination of surface-based contrail observations and numerical weather analyses and forecasts. This model allows predictions of widespread contrail occurrences for contrail research on either a real-time basis or for long-term time scales. Satellite-derived cirrus cloud properties in polluted and unpolluted regions were compared to determine the impact of air traffic on cirrus.
Author
Contrails; Product Development; Numerical Weather Forecasting; Real Time Operation; Air Traffic; Cloud Physics; Meteorological Parameters

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20050188552 National Pediatric Research Inst., Tbilisi, Georgia
A New System of Automated Eco-genetic Database and Modern Conception of Prognosis of Bronchial Asthma
Karseladze, Rusudan; Lia, Zhorzholiani; Goderdzishvili, Liza; Jun. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A433571; No Copyright; Avail: CASI; A02, Hardcopy

No abstract available
Air Pollution; Asthma; Bronchi; Contamination; Data Bases; Epidemiology; Genetics; Human Beings; Phenotype; Prognosis

20050188553 Hellenic Air Force, Athens, Greece
Satellite Interconnection of Military Hospitals of the SEDM Countries (SIMIHO): A Novel Technological Forum as Model for Military Medical Surveillance and Response in SE Europe
Diamantopoulos, Ioannis; Karmiris, Efthimios; Gorgoyiannis, Demetrios; Stathogiannis, Evaggelos; Stauropoulos, Alex.; Jun. 2004; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A433572; No Copyright; Avail: CASI; A03, Hardcopy
No abstract available
Europe; Hospitals; Satellite Communication; Surveillance; Telemedicine

20050188556 Naval Health Research Center, San Diego, CA USA
Modeling Casualty Sustainment During Peacekeeping Operations
Walker, G. J.; Blood, Christopher G.; Oct. 2003; 17 pp.; In English
Contract(s)/Grant(s): Proj-M0095
Report No.(s): AD-A433831; NHRC-03-21; No Copyright; Avail: CASI; A03, Hardcopy
Casualty forecasts for peacekeeping operations allow assessment of the medical resources and personnel needed to support these missions. This report develops a methodology for estimating the casualties that will occur in such operations. Data were extracted from electronic sources detailing the duration, force size and fatalities for United Nations peacekeeping missions, and killed-in-action (KIA) rates were then computed Accounts of peacekeeping incidents in which casualties were sustained were recorded and used to estimate wounded-in-action (WIA) casualty rates. Other data sources were reviewed to derive rates for disease and non-battle injury (DNBI) incidence during peacekeeping missions. The resulting methodology uses the anticipated threat level, force size and estimated operational duration to forecast the expected number of KIA, WIA and DNBI casualties for peacekeeping operations. The distributional properties of casualty occurrence were also investigated to project the number of casualties at various probability levels.
DTIC
Casualties; Medical Personnel; Medical Services; Military Operations

20050188557 Wisconsin Univ., Madison, WI USA
Characterization of the Role of JJAZ1 in Human Breast Cancer
Farnham, Peggy J.; Jan. 2005; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0495
Report No.(s): AD-A433851; No Copyright; Avail: CASI; A03, Hardcopy
We hypothesized that the upregulation of the PcG protein JJAZ1 (now known as Suz12) in human breast cancers leads to chromatin modification and subsequent changes in gene expression. It is difficult to identify genes regulated by PcG proteins due to the fact that these proteins do not directly bind to DNA, but rather are recruited via one or more site-specific DNA binding proteins. Our overall Aim was to demonstrate that our recently developed method, which combines chromatin immunoprecipitation and promoter microarray analysis, could be used to identify a large set of genes that are regulated by JJAZ1/Suz12. We proposed to develop an antibody to JJAZ1/Suz12 and then to use that antibody in combination with a technique which we have developed called ChlP-CpG that would allow us to identify the chromosomal sites bound by JJAZl/Suz12 without prior knowledge of its DNA-binding protein partners. We were successful in developing an antibody to Suz12, have demonstrated that the ChlP-CpG assay can identify Suz12 targets in colon cancers, have collected a number of human breast cancer samples, and are currently completing the studies to identify breast cancer-specific JJAZ1/Suz12 target genes.
DTIC
Breast; Cancer; Mammary Glands; Proteins

20050188560 Creighton Univ., Omaha, NE USA
Best Practices in Medication Safety: Areas for Improvement in the Primary Care Physician's Office
Galt, Kimberly A.; Rule, Ann M.; Clark, Bartholomew E.; Bramble, James D.; Taylor, Wendy; Moores, Kevin G.; May 2005; 30 pp.; In English
Report No.(s): AD-A433906; No Copyright; Avail: CASI; A03, Hardcopy
This research describes a medication safety framework for primary care office-based practices and evaluates how offices manage the medication use of process within this framework. The conceptual model supporting the safety framework integrates structure, process, and outcome quality concepts relevant to medication safety. Medication safety domains were

identified through a review of published literature; the Agency for Healthcare Research and Quality (AHRQ) patient safety agenda; research portfolios, reports, guidelines, and standards from private and public organizations; and an on site evaluation of the medication use process in two primary care offices. Domains identified include the medication use process, technology and safety, the office environment, error management, workplace conditions, safety education, safety perceptions, and patient education. Based upon these domains a 154-item written survey was developed to assess medication safety in office practice. It was administered to 31 primary care office-based practices in the Nebraska and Iowa region, using the interviewer-assisted technique. A direct observation study, on site technology readiness survey, and accessibility of drug information sources were conducted concurrently. Results provide evidence that a medication safety framework is lacking in office-based practice. Suboptimal--and sometimes unacceptable--practices related to medication safety in primary care offices are identified and described. Results may be used to describe the medication safety framework and to identify best practices for office-based medication safety.
DTIC
Clinical Medicine; Drugs; Management Systems; Medical Services; Physicians; Procedures; Quality Control; Safety

20050188561 Connecticut Univ., Farmington, CT USA
The Distribution, Levels, and Relevance of the Interleukin-1 Family of Cytokines and Receptors in Human Breast Carcinoma-Induced Osteolysis
Pantschenko, Alexander G.; Oct. 2004; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0608
Report No.(s): AD-A433931; BC023644; No Copyright; Avail: CASI; A03, Hardcopy
Bone metastasis in human breast carcinoma (HBC) occurs in 83% of patients with advanced disease. HBC bone metastasis causes degeneration of the bone matrix (osteolysis), hypercalcemia, pathologic fracture, and nerve-compression syndrome. The pathophysiology of human breast carcinoma-induced osteolysis (HBC-IO) involves an increase in the number and activity of osteoclasts within the HBC metastatic lesion. We examined the expression of the IL-1 family of cytokines and receptors and IL-8 in HBC-IO using archival human samples (mean age, 52 yrs; age range, 34-83 yrs; no prior radiation to site) and immunohistochemistry. We observed IL-1 and IL-8 expression by HBC cells and IL-1 Receptor I expression on osteoclasts. These data suggested that HBC-derived IL-1 is an important mediator of human breast cancer-induced osteolysis and supports our hypothesis: 1. IL-1 can activate osteoclastogenesis, promote osteoclast (OC) activation and osteolysis via paracrine induction of IL-1 Receptors on osteoclasts. 2. IL-1 can promote tumor progression by autocrine induction and subsequent activation of IL-8. 3. IL-8 expressed by HBC cells can support tumor growth and progression by stimulating angiogenesis through IL-8 Receptors expressed on vascular endothelial cells. This study suggests that IL-1 may be an important mediator of HBC pathophysiology and therefore, a potential target for therapeutic intervention.
DTIC
Breast; Cancer; Immune Systems; Interleukins; Mammary Glands

20050188562 Agency for Healthcare Research and Quality, Rockville, MD USA
Applying Patient Safety Indicators (PSIs) Across Health Care Systems: Achieving Data Comparability
Rivard, Peter E.; Elwy, A. R.; Loveland, Susan; Zhao, Shibei; Tsilimingras, Dennis; Elixhauser, Anne; Romano, Patrick S.; Rosen, Amy K.; Jan. 2005; 20 pp.; In English
Report No.(s): AD-A434017; No Copyright; Avail: CASI; A03, Hardcopy
Patient Safety Indicators (PSIs), developed by the Agency for Healthcare Research and Quality (AHRQ), are administrative data-based indicators that identify potential in-hospital patient safety events. This study developed and tested methods for (1) applying PSIs to Department of Veterans Affairs (VA) discharge data, and (2) comparing VA with non-VA PSI rates. Va inpatient data file structure and elements were modified in order to apply PSIs to VA data; further modifications were required to compare VA and non-VA PSI rates. We found that key measures, including demographics, clinical elements, and length of stay, as well as the PSI rates themselves, are sensitive even to minor data modifications. This paper demonstrates both the adaptation of a database for use with PSIs, and the sensitivity of PSI rates to small differences in database characteristics. The Paper shows how differences in data sources might affect comparisons of event rates across health care systems.
DTIC
Clinical Medicine; Health; Medical Services; Patients; Safety

20050188565 Agency for Healthcare Research and Quality, Rockville, MD USA

Developing a Veterans Health Administration (VHA) Serious Injury Surveillance System that Includes Adverse Event Hospitalizations

Campbell, Robert R.; Bradham, Douglas D.; Sanchez-Anguiano, Aurora; Werner, Dennis H.; Spehar, Andrea M.; French, Dustin; Palacios, Polly; May 2005; 16 pp.; In English

Report No.(s): AD-A434116; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this study was to examine the feasibility of applying the State and Territorial Injury Prevention Directors Association (STIPDA) consensus recommendations for using hospital discharge data in injury and adverse event surveillance to the Veterans Health Administration (VHA) population. The utility of developing an injury surveillance system that also included adverse events due to medical care was examined for its potential contributions to VHA patient safety programs and research. Selected variables from all VHA hospital inpatient discharges for 5 fiscal years (1998-2002) were extracted from the National Patient Care Dataset. The resultant dataset had more than 2.8 million records. The selected variables extracted included demographic and clinical information. Discharges for injuries and adverse events due to medications and medical complications were identified using the primary admitting diagnosis in accordance with STIPDA recommendations. The injuries and adverse events were grouped into categories using the Clinical Classification Software developed by the Agency for Healthcare Research and Quality (AHRQ). The medical care costs for these injury and adverse event hospital discharges were obtained from the VHA Decision Support System (DSS). Over the study time frame, 153,153 injury and adverse event discharges occurred, with more than 1.8 million inpatient days, and $2.0 billion in direct medical care costs. In any given year, injury and adverse event discharges accounted for approximately 10 percent of total hospital medical costs and approximately 5 percent of the total discharges. Hospitalizations for adverse events associated with medical care, or medication adverse events, represented more than 50 percent of the hospitalizations.

DTIC

Accidents; Errors; Health; Injuries; Medical Services; Patients; Safety; Surveillance

20050188569 Utah Univ., Salt Lake City, UT USA

Synthesis of Lipoprotein Immunostimulants for Treating Prostate Cancer

Hinshaw, Jerald C.; Jan. 2005; 16 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0150

Report No.(s): AD-A434134; No Copyright; Avail: CASI; A03, Hardcopy

The prospects of stimulating a patient's own immune system as a therapeutic approach to the treatment of cancer in general, and prostate cancer in particular , is intriguing. However, thus far immunotherapeutic approaches to the treatment of cancer (including prostate cancer) in the clinical setting have not been uniformly successful. We are chemically synthesizing molecular conjugates that comprise a Toll-Like Receptor (TLR) ligand covalently linked to a prostate cancer tumor-associated antigen protein or peptide. Using this tactic, we anticipate that the TLR-Ligand portion of the conjugates will stimulate dendritic cells(DCs) (as well as other TLR-expressing antigen presenting cells to secrete immune-activating T cells. In this way, a new and potent immune system stimulation and antigen presentation mechanism aimed at the stimulation of combined CD8+ and CD4+ T-cell responses, along with B-cell activation via the innate/adaptive immune response connection, is being developed. We have prepared TLR-4 and TLR-7 ligands and are preparing mouse immunization experiments to test the efficacy of this new approach to cancer immunotherapy.

DTIC

Cancer; Clinical Medicine; Immunology; Lipoproteins; Prostate Gland

20050188570 Health Research, Inc., Buffalo, NY USA

Biomarkers of Selenium Chemoprevention of Prostate Cancer

Dong, Yan; Jan. 2005; 42 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0134

Report No.(s): AD-A434139; No Copyright; Avail: CASI; A03, Hardcopy

A major goal of this project is to identify suitable biomarkers of selenium chemoprevention in human prostate cell models. These selenium-responsive biomarkers should be: (i) associated with the molecular mechanism of selenium chemoprevention, (ii) changed in a manner that is consistent with cancer risk reduction, and (iii) easily quantifiable in biopsied samples. We used the cDNA microarray technology to identify these biomarkers because it enables us to simultaneously monitor the expression pattern of a wide spectrum of genes in a single experiment.

DTIC

Biomarkers; Cancer; Prostate Gland; Selenium

20050188573 Walter Reed Army Medical Center, Washington, DC USA
Ophthalmic Care of the Combat Casualty
Lounsbury, Dave E.; Bellamy, Ronald F.; Zajtchuk, Russ; Thach, Allen B.; Jan. 2003; 498 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434144; No Copyright; Avail: CASI; A21, Hardcopy

Along with saving the lives and limbs of our soldiers, sailors, and airmen injured in battle, the preservation of their eyes and eyesight is an extremely important goal. Despite comprising as little as 0.1% of the total body surface area and 0.27% of the frontal silhouette, the proportion of eye injuries in nonfatal casualties has been escalating in recent conflicts (Table). Several reasons account for the increasing risk of eye injuries: 1. preferential exposure of the eyes during combat (eg, foxholes, tank turrets); 2. improved body armor protecting the head, thorax, and abdomen, leading to fewer fatal injuries to these regions of the body; 3. improved surgical techniques and rapid evacuation of the wounded, which allow physicians to repair wounds that at one time would have resulted in the death of a soldier; and 4. improved munitions, which create more and smaller fragments that can cause severe, even blinding, injuries.
DTIC
Casualties; Combat; Eye (Anatomy); Injuries; Medical Services; Military Operations; Ophthalmology

20050188575 Agency for Healthcare Research and Quality, Rockville, MD USA
Evaluating and Predicting Patient Safety for Medical Devices With Integral Information Technology
Zhang, Jiajie; Patel, Vimla L.; Johnson, Todd R.; Chung, Philip; Turley, James P.; Jan. 2005; 15 pp.; In English
Report No.(s): AD-A434178; No Copyright; Avail: CASI; A03, Hardcopy

Human errors in medical device use account for a large portion of medical errors. Most of these errors are due to inappropriate designs for user interactions, rather than mechanical failures. Evaluating and predicting patient safety in medical device use is critical for developing interventions to reduce such errors either by redesigning the devices or, if redesign is not an option, by training the users on the identified trouble spots in the devices. We developed two methods for evaluating and predicting patient safety in medical devices with integral information technology, then applied and tested them on several infusion pumps. The first method is a modified discount-usability method called heuristic evaluation. The method was used to evaluate and compare the safety of two 1-channel volumetric infusion pumps. The results show that heuristic evaluation, when modifies for medical devices, is a useful, efficient, and low-cost method for evaluating patient safety features of medical devices through the identification of usability problems and their severities. The second method is an extended hierarchical task analysis (EHTA), devised to predict medical errors in medical device use. EHTA divides the task space between the external world of the device interface and the internal cognitive world of the user, allowing for descriptive predictions of potential user errors at the human device level. Its use is demonstrated in the analysis of two infusion pumps. The estimates of the likelihood of user errors with the two pumps are consistent with the corresponding reported use errors in the Federal Drug Administration (FDA)'s manufacturer and User Device Experience (MAUDE) database, thus demonstrating the usefulness of this tool for predicting medical device use errors.
DTIC
Information Systems; Management Systems; Medical Equipment; Medical Services; Patients; Predictions; Safety; Safety Devices

20050188576 Agency for Healthcare Research and Quality, Rockville, MD USA
Work System Analysis: The Key to Understanding Health Care Systems
Karsh, Ben-Tzion; Alper, Samuel J.; Jan. 2005; 13 pp.; In English
Report No.(s): AD-A434179; No Copyright; Avail: CASI; A03, Hardcopy

Many articles in the medical literature state that medical errors are the result of systems problems, require systems analyses, and can only be addressed with systems solutions. Within that same body of literature is a growing recognition that human factors engineering methods and design principles are needed to reduce medical error and, hence, increase patient safety. Work system analysis methods, which are based on industrial and human factors engineering tools have much to contribute toward patient safety, specifically because of their focus on systems. They offer principles and methods for analyzing systems, which if followed, should help health care administrators and clinicians properly analyze their units or facilities, and should lead to more robust patient safety interventions. In this paper, steps for executing a work system analysis are provided. To facilitate comprehension of the steps, the medication administration system is used as an example.
DTIC
Health; Systems Analysis

20050188583 Agency for Healthcare Research and Quality, Rockville, MD USA

Reducing the Use of Short-Acting Nifedipine by Hypertensives Using a Pharmaceutical Database

Furmaga, Elaine M.; Glassman, Peter A.; Cunningham, Francesca E.; Good, Chester B.; Jan. 2005; 14 pp.; In English

Report No.(s): AD-A434196; No Copyright; Avail: CASI; A03, Hardcopy

Objective: In view of the widespread concerns against prescribing short-acting nifedipine in the treatment of hypertension, the Veterans Health Administration initiated efforts to decrease the common but unapproved use of that agent for treating high blood pressure. Methods: A multitiered approach was implemented, using a national pharmaceutical database to assess drug utilization, followed by educational or remedial intervention at each tier. The first tier of the study determined the total quantity of short-acting nifedipine dispensed, the second tier evaluated data on the prescriptions for the drug, and the third and fourth tiers evaluated patient-specific information to determine to whom and why the drug was prescribed. Results: The first intervention demonstrated a 34 percent decrease in the total quantity of short-acting nifedipine dispensed, compared with the previous year. And action or change was noted in 78 percent of prescriptions in the second intervention. In the third intervention, short-acting nifedipine was prescribed for hypertension in 46.5 percent of the remaining 559 patients, 96 percent of which resulted in an intervention. The final intervention (75 patients) resulted in one prescribed short-acting nifedipine for hypertension under special circumstances. Conclusion: A tiered approach, using a national pharmaceutical database, complemented by local education and intervention, assisted in reducing the use of short-acting nifedipine for hypertension. DTIC

Blood Pressure; Data Bases; Hypertension; Pharmacology

20050188584 Agency for Healthcare Research and Quality, Rockville, MD USA

Looking for Trouble in All the Right Places: The Legal Implications Associated with 'Electronic Signatures' and High-Risk Clinical Situations

Escobar, Gabriel J.; Folck, Bruce F.; Gardner, Marla N.; Ma, June; Palmer, Larry I.; Liang, Bryan; Nozick, Linda K.; Jan. 2005; 19 pp.; In English

Report No.(s): AD-A434197; No Copyright; Avail: CASI; A03, Hardcopy

The investigators sought to define probabilistic strategies that could support quality improvement and medical error detection by decreasing the need for unselected manual chart review. Combinations of administrative data and laboratory test results ('electronic signatures') were employed to identify discrete, high-risk clinical situations among health plan members of a large managed care organization. The design used was a retrospective cohort study linking hospitalization records, outpatient records, and laboratory results that were formatted using approaches developed for physiologic severity scoring. The original outcomes of interest for the study were clinical situations (e.g., birth injuries or delayed diagnosis of myocardial infarction) that have a strong association with human error. When presented with preliminary results, senior leaders in the investigators' parent organizations raised a number of objections to any public presentation or publication of the results. Because of these objections, the quantitative results presented in this report focus on rapid detection of one outcome-prolonged neonatal assisted ventilation-that has a weak association with human error. Using recursive partitioning, the investigators were able to define subsets of newborns for whom the frequency of the outcome of interest was substantially higher than in the general population (1 percent). For example, an electronic signature identified a subset of infants (comprising 4 percent of the birth cohort) in which the outcome of interest occurred in 22 percent of the newborns. Use of probabilistic electronic strategies could yield significant benefits in medical error research as well as major operational improvements in medical error detection and reporting, quality assurance, and quality improvement.

DTIC

Records Management; Signatures

20050188585 Agency for Healthcare Research and Quality, Rockville, MD USA

Clinical Informatics and Its Usefulness for Assessing Risk and Preventing Falls and Pressure Ulcers in Nursing Home Environments

Teigland, Christie; Gardiner, Richard; Li, Hailing; Byrne, Colene; Jan. 2005; 18 pp.; In English

Report No.(s): AD-A434198; No Copyright; Avail: CASI; A03, Hardcopy

Nursing homes have lagged in the development and use of technology and clinical informatics. This paper describes a practical model of translating clinical informatics research into practice. The Minimum Data Set (MDS) assessment data collected by nursing homes nationwide is translated into knowledge-based information that supports continuous quality improvement. It does so by providing timely Web-based reports alerting staff to the likelihood of an adverse outcome, along with individualized resident risk profiles to guide preventive care plan development. The adverse outcomes addressed in this study falls and pressure ulcers are associated with considerable morbidity and mortality and represent serious quality of care

issues for the elderly nursing home population. These events are usually preventable yet contribute significantly to the growing costs of health care, insurance, and liability. This paper describes the risk reports and how nursing home staffs are using them, barriers to use of clinical informatics, measurable changes in processes, outcomes and quality of care, and implications for other Web-based decision-support systems in long term care settings.
DTIC
Medical Services; Risk; Ulcers

20050188592 Agency for Healthcare Research and Quality, Rockville, MD USA
A Conceptual Model for Disclosure of Medical Errors
Fein, Stephanie; Hilborne, Lee; Kagawa-Singer, Margie; Spiritus, Eugene; Keenan, Craig; Seymann, Gregory; Sojania, Kaveh; Wenger, Neil; Jan. 2005; 13 pp.; In English
Report No.(s): AD-A434207; No Copyright; Avail: CASI; A03, Hardcopy

Objective: Patient safety is fundamental to high-quality patient care. Critical steps toward improving the safety of the health care system include ensuring that the system is aware of its errors so that effective remedies can be applied, and enhancing the trustworthiness of the health care system for patients by disclosing errors that are meaningful to them. This study aimed to construct a conceptual model of the factors that facilitate or hinder disclosure of medical errors. Methods: We conducted 25 separate focus groups with attending physicians, nurses, residents, patients, and hospital administrators at 5 academic medical centers in a university health care system. The protocol probed the ethical perceptions of participants and the details of disclosure expectations. Audiotapes of the focus groups were transcribed and analyzed using Atlas.ti software. Codes were assigned to the text in an iterative fashion. Themes were identified and assembled into a model of disclosure. Results: All groups believed that errors should be disclosed. Important influences on whether disclosure would occur fell into four categories: provider factors, patient factors, error factors, and institutional culture. Provider issues included perceived professional responsibility, fears, and training. Patient factors included their desire for information, level of health care sophistication, and rapport with their provider. Error factors included level of harm and whether patients and others were aware of the error and the harm. Perceived tolerance for error and a supportive infrastructure were institutional factors that influenced disclosure. Conclusion: This grounded model of error disclosure delineates areas for interventions to increase disclosure as a step toward improving patient safety.
DTIC
Errors; Patients; Safety

20050188597 Agency for Healthcare Research and Quality, Rockville, MD USA
Implementation of an Evidence-Based Protocol for Surgical Infection Prophylaxis
Savino, John A.; Smeland, Jane; Flink, Ellen L.; Ruperto, Angelo; Hines, Amanda; Sullivan, Thomas; Galvin, Kerri; Risucci, Donald A.; Jan. 2005; 13 pp.; In English
Report No.(s): AD-A434217; No Copyright; Avail: CASI; A03, Hardcopy

An evidence-based surgical antimicrobial prophylaxis (AMP) protocol was implemented in multiple facilities to determine if compliance led to a decrease in New York State reportable surgical site infections (SSIs). Implementation focused on changing practitioner behavior. An evidence-based protocol was developed and approved by participating clinical divisions in the five hospitals involved in the project. Quality assurance (QA) processes were established at each facility to promote compliance. One facility included repeated noncompliance with the protocol in physicians' QA profiles. Randomly selected clean and clean-contaminated procedures were retrospectively reviewed for patients discharged in 2001 (prior to AMP implementation) and 2003 (the implementation period). Trained nurses collected data on compliance with selection of the appropriate antibiotic, timing of administration, redosing, dose adjustment, and postoperative duration. Compliance indicators improved at all facilities. Compliance with the combination of all five indicators improved from 11 percent to 34 percent (P\h0.001), and there was a nonsignificant decrease (3.0 percent vs. 2.5 percent; P = 0.22) in SSI rates. Compliance with an AMP protocol can be increased by implementing a multifaceted QA and educational process focused on changing physician behavior. Medical board oversight of noncompliance and inclusion in the physician QA profile seemed to be the most efficacious step in assuring physician compliance.
DTIC
Health; Infectious Diseases; Prophylaxis; Protocol (Computers)

20050188598 Agency for Healthcare Research and Quality, Rockville, MD USA
Improving Patient Safety With the Military Electronic Health Record
Charles, Marie-Jocelyne; Harmon, Bart J.; Jordan, Pamela S.; Jan. 2005; 13 pp.; In English
Report No.(s): AD-A434219; No Copyright; Avail: CASI; A03, Hardcopy

The USA Department of Defense (DoD) has transformed health care delivery in its use of information technology to automate patient data documentation, leading to improvements in patient safety. The Department uses an enterprise-wide medical and dental clinical information system that generates, maintains, and provides 24-hour secure online access to longitudinal health records. CHCS II, the military's next generation of its Electronic Health Record (EHR), enhances patient safety for more than 9 million beneficiaries, with 'one patient, one record.' Because military families are highly mobile, the EHR makes the patient's medical history available at the point of care at any military medical facility in the world, thus greatly improving overall health care delivery and supporting patient safety initiatives for DoD beneficiaries. Currently, the military EHR supports 55,000 outpatient encounters each week. It provides a legible and longitudinal clinical record that includes drug interaction alerts, patient allergy notifications, and wellness reminders to enhance health care delivery.
DTIC
Health; Patients; Records Management; Safety

20050188601 Agency for Healthcare Research and Quality, Rockville, MD USA
Decision Support System Design and Implementation for Outpatient Prescribing: The Safety in Prescribing Study
Feldstein, Adrianne C.; Smith, David H.; Robertson, Nan R.; Kovach, Christine A.; Soumerai, Stephen B.; Simon, Steven R.; Sittig, Dean F.; Laferriere, Daniel S.; Kalter, mara; Jan. 2005; 17 pp.; In English
Report No.(s): AD-A434222; No Copyright; Avail: CASI; A03, Hardcopy

Decision support (i.e., alerts and reminders) at the time of medication prescribing has been shown to be an effective method for reducing potential medication errors for inpatients, but much less is known about the effects in the outpatient setting. Using qualitative methods to inform our work, medication safety decision support and provider education interventions were designed to improve the use of medications in ambulatory care. This paper presents the study rationale, design, development, and implementation of the interventions. We include a summary of the qualitative findings, including usability testing of the decision support, and we describe how the qualitative findings enhanced the intervention design. We also describe our approach to clinician recruitment. We enumerate limitations of the existing electronic medical record to accommodating recommendations from the qualitative work and usability testing. Our qualitative interviews suggest that clinicians prefer decision support alerts that are clear, concise, and easy to navigate, with minimal information in the alert text. In usability testing, we found that decision support alerts are followed less often when they appear at inappropriate times in workflow, are difficult to read, add to time pressure, and are canceled before being fully read. Our deliberate approach to clinician recruitment for the educational sessions achieved an impressive attendance rate of 85 percent. This study shows that careful consideration of alert design and provider education is critical. Future work will examine the effectiveness of the decision support and whether our educational intervention improves physician response.
DTIC
Clinical Medicine; Decision Support Systems; Safety; Systems Engineering

20050188603 Texas Technological Univ., Lubbock, TX USA
Real-Time Detection of Telomerase in a Microelectromechanical Systems Platform
Gilbertson, Jeremy R.; May 2005; 148 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434224; No Copyright; Avail: CASI; A07, Hardcopy

The integration of biology with Microelectromechanical Systems and Nanotechnology could result in a synergism with tremendous benefits in both basic research and clinical assays. The development of a functionalized liquid core waveguide to detect a biological function or substance via fluorescence could have broad range applications. One such target of interest for developing such a system, is the ribonucleoprotein enzyme telomerase. It is a confirmed biomarker for cancer; having been associated with over 90% of cancers examined. Development of a MEMS-based detection system would allow for accurate detection of small numbers of target molecules in the sample volumes. In order to accomplish this I first developed a bench-top assay to identify key components of the reaction and optimize the detection scheme before incorporation into a MEMS device. This assay itself will have utility in basic research labs for telomerase detection. My ongoing efforts to synthesize such a system has resulted in the modification of the inside surface of the capillary using rapid, straightforward chemistry in order to indirectly attach a molecular beacon. The molecular beacon, the key component of the functionalized capillary, is a strand of DNA that is folded into a specific structure corresponding to the capture sequence that also contains a fluorophore and quencher moiety. When the fluorophore and quencher molecules are in close proximity, fluorescence resonance energy transfer FRET) takes place; effectively quenching the flurescence emission. However, binding of the target DNA, RNA, or protein to the molecular beacon target capture sequence causes a conformational change that separates the fluorophore and the quencher at which point fluorescent signal can be detected. The incorporation of this functionalized liquid core waveguide with a PDMS

chip will facilitate fluid control and optic fiber couplings for fluorescence detection.
DTIC
Clinical Medicine; Deoxyribonucleic Acid; Detection; Microelectromechanical Systems; Nanotechnology; Real Time Operation

20050188609 Agency for Healthcare Research and Quality, Rockville, MD USA
Using Specialized Information Technology to Reduce Errors in Emergency Cardiac Care
Daudelin, Denise H.; Kwong, Manlik; Beshansky, Joni R.; Selker, Harry P.; Jan. 2005; 16 pp.; In English
Report No.(s): AD-A434231; No Copyright; Avail: CASI; A03, Hardcopy

Information Technology (IT) solutions to patient safety/medical error problems are promising, but only in the early stages of their development and implementation. Many current IT applications for patient safety are focused on hospital processes, such as physician order entry and clinical information system based alerts for critical values. These interventions are broadly based, often targeting all medications ordered or all critical values for all patients, and, by necessity, are not specifically configured to address the care of patients with a particular condition or clinical problem. However, a condition-or problem-oriented IT system might better integrate into the care of frequent conditions and thereby be more effective. Accordingly, the authors focused on the use of IT for the most common serious conditions requiring emergency and acute care the diagnosis, triage, and treatment of emergency department (ED) patients with potential acute coronary syndrome (ACS). This condition includes acute myocardial infarction (AMI), also known as acute cardiac ischemia (ACI), and unstable angina pectoris (UAI), a condition that can lead to AMI. The Acute Cardiac Ischemia Time-Insensitive Predictive Instrument Information System (ACI-TIPI-IS) Demonstration Project at Tufts New England Medical Center used multiple IT applications for patient safety, combining real-time decision support, alerting, and retrospective feedback for performance improvement, all for the care of patients presenting to the ED with symptoms suggestive of ACS. A Web-based relational database system, the TIPI-IS, electronically compiled information from existing operational systems about all ED patients for whom an electrocardiogram (ECG) was done for possible ACS symptoms, and supported the patient safety aspects of the project. Real-time decision support was provided by the automatic printing of the probability of ACS on the ECG, as calculated by the ACI-TIPI.
DTIC
Cardiovascular System; Decision Support Systems; Emergencies; Errors; Heart; Information Systems

20050188617 Michigan State Univ., East Lansing, MI USA
Microbial Fuel Cells and Sensors
Zeikus, J. G.; Jun. 2005; 4 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0190
Report No.(s): AD-A434246; No Copyright; Avail: CASI; A01, Hardcopy

This final report presents information on a new generation of graphite electrodes containing iron or manganese that were developed for use in microbial fuel cells and sensor devices. These electrodes were employed to sense chemicals and to produce electricity from sewage sludge and marine sediments.
DTIC
Electric Generators; Electric Power Plants; Electrodes; Fuel Cells; Graphite; Microorganisms

20050188620 Agency for Healthcare Research and Quality, Rockville, MD USA
From Science to Service: A Framework for the Transfer of Patient Safety Research into Practice
Nieva, Veronica F.; Murphy, Robert; Ridley, Nancy; Donaldson, Nancy; Combes, John; Mitchell, Pamela; Kovner, Christine; Hoy, Elizabeth; Carpenter, Deborah; May 2005; 14 pp.; In English
Report No.(s): AD-A434249; No Copyright; Avail: Defense Technical Information Center (DTIC)

A conceptual framework was developed to help maximize and accelerate the transfer of research results from AHRQ's patient safety research portfolio to health care delivery. The framework can be used by the patient safety portfolio as well as individual researchers to develop plans, tools, and strategies for moving research into practice. The framework presents three major stages in moving research findings toward utilization. The first stage is 'Knowledge creation and distillation.' New knowledge generated by the AHRQ research portfolio covers a broad array of topics and differs in the extent to which specific findings are ready for translation into practice. The knowledge produced needs to be evaluated, synthesized, and prioritized for translation efforts. The second stage is 'Diffusion and dissemination.' The framework posits the importance of developing partnerships with knowledge brokers and connector organizations to effectively reach a variety of end users in two ways: mass

diffusion and targeted dissemination. The goal of mass diffusion is providing information and raising general awareness, while the goal of targeted dissemination is persuading and motivating potential knowledge users into action. The third stage is 'End user adoption, implementation, and institutionalization.' To transition from abstract knowledge to concrete use, research findings must be translated into intervention packages that include guidelines, information materials, training, and other implementation aids. The end users must have a change leader and team. General intervention tools need to be adaptable to local needs and go through several iterations to ensure a fit between the conceptual intervention and the organizational context. As the intervention gains acceptance and feasibility within the organization, it is institutionalized in official policies and procedures.
DTIC
Clinical Medicine; Information Management; Medical Science; Patients; Safety

20050188621 Agency for Healthcare Research and Quality, Rockville, MD USA
Making a Case for Organizational Change in Patient Safety Initiatives
Ramanujam, Rangaraj; Keyser, Donna J.; Sirio, Carl A.; May 2005; 12 pp.; In English
Contract(s)/Grant(s): U18-HS1-1926-02
Report No.(s): AD-A434250; No Copyright; Avail: CASI; A03, Hardcopy

Widespread organizational change is indispensable for significantly improved patient safety. This paper discusses critical issues in effective change management, drawing attention to the unintended consequences of pursuing patient safety without effective change management. It includes pointers from organizational change literature on critical issues in managing change, such as how change is defined, what the roles are of different participants, and how change is implemented and made self-sustaining. The authors make some preliminary observations about mismanaged change processes in patient safety initiatives. They conclude that the challenge of patient safety is not only clinical, but also organizational. To succeed, patient safety initiatives must be designed and executed using change management principles such as congruent changes targeting multiple components, specific change management roles for different participants in the care-delivery process, implementation through dedicated support structures and multiple tactics, and institutionalization through enhanced workforce capabilities and opportunities for continuous learning. The costs of mismanaging change go beyond the failure of patient safety initiatives -- they include hardened employee skepticism toward calls for increased patient safety.
DTIC
Clinical Medicine; Management Planning; Medical Services; Patients; Safety

20050188622 Agency for Healthcare Research and Quality, Rockville, MD USA
Organizational Climate of Staff Working Conditions and Safety -- An Integrative Model
Stone, Patricia W.; Harrison, Michael I.; Feldman, Penny; Linzer, Mark; Peng, Timothy; Roblin, Douglas; Scott-Cawiezell, Jill; Warren, Nicholas; Williams, Eric S.; May 2005; 16 pp.; In English
Contract(s)/Grant(s): RFA-HS01-005
Report No.(s): AD-A434251; No Copyright; Avail: CASI; A03, Hardcopy

This project sought to compare measures of organizational climate in ongoing patient safety studies, identify similarities and setting-specific dimensions, develop a model of climate domains that are hypothesized to affect outcomes across settings, and test aspects of the model. Investigators who had surveyed health care workers' perceptions of organizational climate in six studies funded by the Agency for Healthcare Research and Quality (AHRQ) were invited to participate. Survey items from each study were classified using four climate domains found in a prior literature review. The authors discussed subconstructs, proposed additional constructs, developed an integrative model, and independently tested selected aspects of the model. The investigators who participated had studied acute care, home health care, long-term care, and multiple settings; two investigators had studied primary care. More than 80,000 workers were surveyed. The model's core climate domains included leadership (e. g., values) and organizational structural characteristics (e.g., communication processes and information technology), the impact of which was mediated by four process variables: supervision, group behavior (e.g., collaboration), quality emphasis (e.g., patient centeredness), and work design (e.g., staffing). These factors affect health care worker outcomes (e.g., satisfaction and intention to leave) and patient outcomes. Overall, the full model explained 24 to 65 percent of the variance in employee satisfaction, but was not as effective at predicting intention to leave. While some of these domains appeared in prior models, new domains -- quality emphasis, new subconstructs, information technology, and patient centeredness -- are emerging. The model invites dialogue among researchers and informs agenda-setting for future research into organizational climate and the safety of patients and health care employees.
DTIC
Climate; Management Systems; Medical Personnel; Medical Services; Patients; Safety; Tasks

20050188623 Agency for Healthcare Research and Quality, Rockville, MD USA
The Impact of Personal Digital Assistant Devices on Medication Safety in Primary Care
Galt, Kimberly A.; Rule, Ann M.; Taylor, Wendy; Siracuse, Mark; Bramble, J. D.; Rich, Eugene C.; Young, Wayne; Clark, Bartholomew; Houghton, Bruce; Jan. 2005; 18 pp.; In English
Report No.(s): AD-A434252; No Copyright; Avail: CASI; A03, Hardcopy

This study determines the impact that use of personal digital assistants (PDAs) has on avoiding potential medication prescribing errors in primary care, office-based practices. the specific aims are to (1) measure the occurrence of prescribing-related errors, (2) determine the extent to which medication prescribing errors may be reduced by physicians having improved access to pharmaceutical information at the point of care via the PDA and use of the PDA as a prescription-printing device, and (3) identify perceived barriers to PDA use and successful strategies to overcome these barriers. A prospective, randomized, controlled trial of 78 physicians was conducted in 31 primary care, office-based practices to determine the impact of PDA use on medication prescribing errors. The intervention group was trained by case simulation to use a PDA-based clinical drug information application at the point of care during the prescribing process, and enter and print prescriptions on a local printer via the PDA. The control group maintained their traditional prescribing practices throughout the study. Qualitative interviews were conducted with the intervention group to identify perceived barriers to PDA use and successful strategies to overcome these barriers. The outcome indicates that voluntary use of the PDA results in substantial reductions in errors of legibility, omissions, and use of abbreviations and symbols. Variation in adoption of the PDA as both a prescribing device and drug information tool was observed. Barriers and successful strategies to overcome the barriers to PDA use are identified. The PDA offers an effective method to bring prescribing safety to primary care, office-based practices.
DTIC
Digital Computers; Medical Personnel; Safety

20050188627 Agency for Healthcare Research and Quality, Rockville, MD USA
Validation of AHRQ's Patient Safety Indicator for Accidental Puncture or Laceration
Gallagher, Brian; Cen, Liyi; Hannan, Edward L.; Jan. 2005; 13 pp.; In English
Contract(s)/Grant(s): 1U18HS11880
Report No.(s): AD-A434262; No Copyright; Avail: CASI; A03, Hardcopy

This study examined whether clinical evidence in medical records confirms ICD-9-CM diagnoses that identify the Patient Safety Indicator (PSI) accidental puncture or laceration (APL), and examined the utility of procedure codes in identifying patients who suffered an APL.
DTIC
Accidents; Clinical Medicine; Injuries; Patients; Piercing; Safety

20050188628 Virginia Commonwealth Univ., Richmond, VA USA
Lysophosphatidic Acid Regulation and Roles in Human Prostate Cancer
Spiegel, Sarah; Jan. 2005; 68 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0060
Report No.(s): AD-A434263; No Copyright; Avail: CASI; A04, Hardcopy

Lysophosphatidic acid (LPA) is a major mitogen in serum that regulates an array of cellular processes related to pathogensis of cancer, especially ovarian, prostate and breast cancer. Interest in LPA has accelerated recently with the discovery that it is a ligand of a family of three G protein coupled cell surface receptors. Prostate cancer cells express these LPA receptors and it has been suggested that their expression correlates with more advanced prostate cancer. We found that androgen markedly upregulates express of LPA(3) in LNCaP cells which are androgen-responsive prostate cancer cells, making them more similar to early stage carcinoma. In this grant period, we cloned a novel type of lipid kinase (MDGK) which phosphorylates monoacylglycerols and diacylglycerols to form LPA and PA, respectively. Both have been implicated in growth and survival of prostate cancer cells. Using a matched human tumor/normal tissue expression array, we found that MDGK expression was strikingly upregulated in prostate cancers compared to the normal prostate tissues from the same patient. In contrast, MDGK was similarly expressed in other types of cancers compared to their normal tissue counterparts, including kidney, breast, colon, and stomach cancers.
DTIC
Acids; Cancer; Prostate Gland

20050188632 Agency for Healthcare Research and Quality, Rockville, MD USA
Readmissions for Selected Infections Due to Medical Care: Expanding the Definition of a Patient Safety Indicator
Gallagher, Brian; Cen, Liyi; Hannan, Edward L.; Jan. 2005; 13 pp.; In English
Contract(s)/Grant(s): U18-HS11880
Report No.(s): AD-A434267; No Copyright; Avail: CASI; A03, Hardcopy
Objective: Evaluate the Agency for Healthcare Research and Quality's Patient Safety Indicator that identifies patients with selected infections that result from medical care during hospital inpatient treatment (secondary diagnosis of selected infection/infection not present at admission).
DTIC
Infectious Diseases; Medical Services; Patients; Safety

20050188635 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Perceptions of North Dakota Registered Nurses Regarding Advance Directives
Fritel, Nichole A.; May 2005; 94 pp.; In English
Report No.(s): AD-A434271; AFIT-CI04-1100; No Copyright; Avail: CASI; A05, Hardcopy
One of the functions of nurses is to assist individuals to achieve a peaceful death. In order to fulfill this role, patient end-of-life wishes must be communicated to family members and health care providers. Since passage of the Patient Self-Determination Act (PSDA) in 1990, advance directives have served as the legal vehicle and communication tool for bringing about an understanding of these wishes, should the patient be unable to competently speak for him/herself. Unfortunately, although the majority of Americans favor the provisions that living wills and health care powers of attorney contain, only a small fracton actually complete advanced directives. As one of the largest and most accessible members of the health care team, nurses are in an ideal position to serve as advocates and educators for the facilitation of informed decision-making for patients making choices about end-of-life care. However, a nurse's ability to advocate is greatly effected by a number of essential concepts, such as perception, time, interaction, role, power, status, comfort level, and decision-making.
DTIC
Medical Personnel; Medical Services; Perception

20050188637 Agency for Healthcare Research and Quality, Rockville, MD USA
Developing a Taxonomy for Coding Ambulatory Medical Errors: A Report From the ASIPS Collaborative
Pace, Wilson D.; Fernald, Douglas H.; Harris, Daniel M.; M. Dickinson, L.; Araya-Guerra, Rodrigo; Staton Rebecca VanVorst, Elizabeth W., Bennett L; Jan. 2005; 12 pp.; In English
Contract(s)/Grant(s): U18HS011878-02
Report No.(s): AD-A434273; No Copyright; Avail: CASI; A03, Hardcopy
Multiple taxonomies are used to classify medical errors. Most are conceptually based with limited empirical evidence on their utility to characterize processes leading to errors. We analyzed the utility of the Dimensions of Medical Outcomes taxonomy to describe medical errors and their relationship to harm.
DTIC
Coding; Errors; Medical Services; Taxonomy

20050188638 Agency for Healthcare Research and Quality, Rockville, MD USA
What Happens After a Patient Safety Event? Medical Expenditures and Outcomes in Medicare
Encinosa, William E.; Hellinger, Fred J.; Jan. 2005; 15 pp.; In English
Report No.(s): AD-A434275; No Copyright; Avail: CASI; A03, Hardcopy
To estimate the impact of potentially preventable adverse events on health care costs and outcomes.
DTIC
Medical Services; Patients; Safety

20050188639 Agency for Healthcare Research and Quality, Rockville, MD USA
Financial and Demographic Influences on Medicare Patient Safety Events
Bernard, Didem; Encinosa, William E.; Jan. 2005; 16 pp.; In English
Report No.(s): AD-A434276; No Copyright; Avail: CASI; A03, Hardcopy
Background: The hospital market is stratified between the 'have' and the 'have not' hospitals. Whether financial disparities

among hospitals are associated with disparities in patient safety problems is unknown.
DTIC
Demography; Financial Management; Hospitals; Medical Services; Patients; Safety

20050188641 Agency for Healthcare Research and Quality, Rockville, MD USA
Identification, Classification, and Frequency of Medical Errors in Outpatient Diabetes Care
O'Connor, Patrick J.; Sperl-Hillen, JoAnn M.; Johnson, Paul E.; Rush, William A.; Jan. 2005; 13 pp.; In English
Report No.(s): AD-A434279; No Copyright; Avail: CASI; A03, Hardcopy

Diabetes-related medical errors in outpatient practice are common and costly. This study attempts to accurately identify, classify, and interpret patterns of diabetes-related medical errors in primary care settings using diagnostic, laboratory, and pharmacy data.
DTIC
Classifications; Clinical Medicine; Errors; Frequencies; Medical Services; Metabolic Diseases

20050188643 Naval Health Research Center, San Diego, CA USA
Projection of Patient Condition Code Distributions Based on Mechanism of Injury
Zouris, James M.; Walker, G. J.; Blood, Christopher G.; Jan. 2003; 16 pp.; In English
Contract(s)/Grant(s): Proj-M0095
Report No.(s): AD-A434281; BUMED-03-23; No Copyright; Avail: CASI; A03, Hardcopy

The Medical Readiness and Strategic Plan 1998-2004 requires that the military services develop a method for linking real world patient load data with modern patient condition codes to enable planners to forecast medical workload and resource requirements. Medical planners and logisticians utilize modeling and simulation tools to plan for medical contingencies based on anticipated patient streams, availability of evacuation assets, mix of health care providers, adequacy of the local infrastructure and the volume of needed medical materials. Determination of the likely distribution of injuries and illnesses during combat operations is a particularly critical component to the assessment of the needed medical resources required at the various levels of medical care. The objective of the proposed effort is to more accurately project patient streams contingent on the likely weapons that US forces will encounter in future combat operations. By incorporating causative agents and their prospective impacts, a refinement of current patient stream projections is possible. Presently, patient stream estimations are based on the expected trauma categories derived from casualty distributions observed in previous operations. It is the goal of this effort that the likely distribution of expected causative agents be derived prior to estimating the expected trauma categories.
DTIC
Casualties; Injuries; Medical Services; Military Operations; Patients

20050188644 Maryland Univ. Baltimore County, Catonsville, MD USA
Development and Evaluation of Novel Implantable Nanosensors for Real-Time Monitoring of Individual Cells and Cellular Signaling
Cullum, B. M.; Ostrand-Rosenberg, S.; Alexander, T.; Jan. 2005; 17 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0248
Report No.(s): AD-A434282; AFRL-SR-AR-TR-05-0214; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this project was to develop and demonstrate the potential of a versatile class of nano-biosensors capable of being implanted within individual living cells for the direct conversion of biochemical signaling events into electronic information. In order to monitor the various biochemical species responsible for intracellular signaling (e.g., proteins), with minimal stress to the cell during analysis, we are developing nanobead sensors between 200 and 500 nm in diameter that are capable of being non-invasively positioned at different locations within a living cell via optical tweezers. These sensors employ surface enhance Raman spectroscopy (SERS) and allow for the qualitative as well as quantitative monitoring of the expression of the specific proteins required for cellular response. Monitoring intracellular signaling species in this fashion allows for the detection of the earliest possible signals associated with a stimulation event, as well as allows for the differentiation of various events from one another at the earliest possible time.
DTIC
Detectors; Implantation; Real Time Operation

20050188645 Agency for Healthcare Research and Quality, Rockville, MD USA
Learning From Errors in Ambulatory Pediatrics
Mohr, Julie J.; Lannon, Carole M.; Thoma, Kathleen A.; Woods, Donna; Slora, Eric J.; Wasserman, Richard C.; Uhring, Lynne; Jan. 2005; 15 pp.; In English
Contract(s)/Grant(s): U18HS10397
Report No.(s): AD-A434283; No Copyright; Avail: CASI; A03, Hardcopy

Approximately 70 percent of pediatric care occurs in ambulatory settings, yet there has been little research on errors and harm in these settings. Given the importance of understanding harm in ambulatory pediatrics, this study was funded by the Agency for Healthcare Research and Quality (AHRQ) as part of the University of North Carolina (UNC) Center for Education and Research on Therapeutics (CERTs), in partnership with the American Academy of Pediatrics (AAP) Pediatric Research in Office Settings (PROS) Network.
DTIC
Errors; Medical Services; Patients

20050188646 Agency for Healthcare Research and Quality, Rockville, MD USA
Taxonomic Guidance for Remedial Actions
Thomadsen, Bruce; Lin, Shi-Woei; Jan. 2005; 13 pp.; In English
Report No.(s): AD-A434286; No Copyright; Avail: CASI; A03, Hardcopy

Objectives: This project developed a taxonomy to provide guidance in selecting remedial actions to address problems uncovered during root cause analyses of events in a medical setting.
DTIC
Guidance (Motion); Taxonomy

20050188647 Agency for Healthcare Research and Quality, Rockville, MD USA
Fundamentals of Medicare Patient Safety Surveillance: Intent, Relevance, and Transparency
Hunt, David R.; Verzier, Nancy; Abend, Susan L.; Lyder, Courtney; Jaser, Lisa J.; Safer, Nancy; Davern, Paul; Jan. 2005; 14 pp.; In English
Report No.(s): AD-A434287; No Copyright; Avail: CASI; A03, Hardcopy

The Medicare Patient Safety Monitoring System (MPSMS) is a national surveillance project aimed at identifying the rates of specific adverse events within the Medicare population. Created under the auspices of the Department of Health and Human Services' Patient Safety Task Force, this surveillance system identifies adverse events from randomly selected inpatient Medicare discharges and administrative data. This system is immense in scope and provides national rates of adverse events by employing explicit review criteria for all patient safety topics. The MPSMS explicit review is a patient-centered process focusing on patient harm rather than provider or system error, and has the following features: normalized inter-rater reliability; lower cost-per-chart reviewed than the traditional clinical expert-based implicit review; and the potential for comparative analysis across time and health care systems. A limitation to our approach is the reliance on administrative data to complete any post-discharge surveillance required. This paper explores the precepts behind the MPSMS review process. Three principles-intent, relevance, and transparency-describe the conceptual underpinnings for our approach.
DTIC
Errors; Medical Services; Patients; Safety; Surveillance

20050188652 Agency for Healthcare Research and Quality, Rockville, MD USA
The AAFP Patient Safety Reporting System: Development and Legal Issues Pertinent to Medical Error Tracking and Analysis
Phillips, Robert L.; Dovey, Susan M.; Hickner, John S.; Graham, Deborah; Johnson, Michele; May 2005; 15 pp.; In English
Report No.(s): AD-A434292; No Copyright; Avail: CASI; A03, Hardcopy

The Institute of Medicine makes the case that patient safety data are a critical input for redesigning care processes in ways that will make health care safer. Mandatory and voluntary error-reporting systems are sources of such data. However, a chasm of legal and practical problems exists between the collection of error reports and responding to reporting providers to improve the quality and safety of the systems in which they work. Between 2000 and 2004, the American Academy of Family Physicians (AAFP) developed and tested a voluntary error-reporting system. In this paper we discuss the current design of the AAFP's system and the legal and practical constraints that stand in the way of its becoming a more robust quality-improvement tool. We explain decisions to make the reporting system Web-based (rather than paper-based), to be anonymous

(rather than confidential), to not provide direct or specific feedback to reporters, and to make it capable of receiving reports of both sentinel events and intensive reporting. This paper will clarify what is currently done with error reports and how, despite current limitations, the reporting system informs and promotes a variety of other quality initiatives of the AAFP. We also highlight how this reporting system could more robustly improve patient safety and quality in health care if legislative and other remedies are implemented to bridge the existing chasm.
DTIC
Error Analysis; Errors; Health; Legal Liability; Medical Services; Patients; Safety

20050188666 Agency for Healthcare Research and Quality, Rockville, MD USA
Barcode Medication Administration: Lessons Learned From an Intensive Care Unit Implementation
Wideman, Mary V.; Whittler, Michael E.; Anderson, Timothy M.; May 2005; 16 pp.; In English
Report No.(s): AD-A434315; No Copyright; Avail: Defense Technical Information Center (DTIC)

An electronic barcode medication administration system was successfully implemented in the acute care and long-term care sections of a 118-bed Veterans Administration hospital beginning in February 2000. Known as Barcode Administration (BCMA), the software was designed to improve medication administration accuracy and to generate online patient medication records. The application was created by the Eastern Kansas Health Care System and the Colmery-O- 'Neil VA Medical Center, and was modified to meet the general requirements of all U.S. Veterans Health Administration (VHA) medical centers. The nationally implemented Barcode Medication Administration software enables users to document electronically the administration of medications at the bedside, or where other points of care are involved. Barcode technology and real-time network connectivity are used to improve the accuracy of medication administration. The barcode software implementation proved problematic in the 10-bed intensive care unit (ICU) for a number of reasons, including the lack of functionality related to the documentation of intravenous fluid administration and the need for immediate software access for urgent medication documentation. The ICU staff stopped using the BCMA software in November of 2000, eight months after the initial implementation. Department of Veterans Affairs' programmers made additional enhancements to the software and the BCMA program was re-implemented in November of 2002. Staff and management confidence in the enhanced software remained weak following the re-implementation, so a system of dual documentation of medications prescribed for patients following open-heart surgery. This complex patient population was selected purposely because delays in critical medication administration can produce life-threatening results. Solutions identified in the treatment of such priority patients would lead to improved care for all ICU patients.
DTIC
Accuracy; Patients

20050188671 Agency for Healthcare Research and Quality, Rockville, MD USA
Suicide Risk Response: Enhancing Patient Safety Through Development of Effective Institutional Policies
Bonner, Laura; Felker, Bradford; Chaney, Edmund; Vollen, Karen; Berry, Karen; Revay, Barbara; Simon, Barbara; Kofoed, Lial; Ober, Scott; Worley, Linda; Jan. 2004; 14 pp.; In English
Report No.(s): AD-A434321; No Copyright; Avail: CASI; A03, Hardcopy

A suicidal patient requires a prompt, coordinated intervention. In this paper, we describe a process for developing a suicidality policy, which may help clinics develop effective, locally adapted policies. We present the process in the framework of the Quality Improvement Plan-Do-Study-Act cycle. The process we describe occurred as part of a quality improvement project. Translating Initiatives for Depression into Effective Solutions (TIDES) is an evidence-based. quality improvement intervention for depression, implemented in seven Veterans Administration primary care clinics in five states. A multidisciplinary workgroup, the Collaboration Workgroup (CWG), created for this project supports the collaborative care process through evaluation and improvement of policies, including those for institutional response to suicidality. During the 'plan' phase, the workgroup reviewed existing policies from each of the seven participating intervention clinics. This review revealed significant gaps and implementation difficulties. During the 'do' phase, workgroup members developed or adapted sit-specific policies as needed based on the initial CWG review, and assisted sites in implementing them. During the 'study' phase, workgroup members reviewed what had worked and what had not worked in implementing policies for threatened suicide at each site and identified a set of hey features of successful policies. Features included a clearly defined chain of responsibility, well-defined followup procedures, and documentation of actions in the medical record. The workgroup developed templates that emphasized these key features but allowed for necessary local adaptation. Workgroup clinicians assisted clinics to implement site-specific policies. During the 'act', phase which is ongoing, site policies are in effect and are being evaluated.
DTIC
Patients; Policies; Risk; Safety

20050188674 Agency for Healthcare Research and Quality, Rockville, MD USA
Voluntary Hospital Coalitions to Promote Patient Safety
Rask, Kimberly J.; Naylor, Dorothy V.; Schuessler, Linda; Jan. 2005; 14 pp.; In English
Report No.(s): AD-A434324; No Copyright; Avail: CASI; A03, Hardcopy

Translating research or care innovation into broader clinical practice requires more than simply the publication of new findings. Understanding both the perspectives of the target providers and the environmental factors that can facilitate or impede adoption is key to getting 'buy in ' and achieving eventual implementation. This paper describes a unique patient safety initiative developed by the Georgia Hospital Association (GHA), working closely with State regulatory agencies and health care professional groups. Building upon existing relationships, GHA and its collaborators formed the Partnership for Health and Accountability (PHA) as a comprehensive, voluntary patient safety program. With a focus on systemic prevention strategies, PHA fulfills both dissemination and implementation roles in translating research into practice. The program, which involves adult acute care hospitals across the State, has shown that engaging health care organizations in an iterative change process, while focusing on an ultimate goal, can yield promising results. Included here is a description of challenges encountered in the change process, and preliminary evidence of success.
DTIC
Hospitals; Patients; Prevention; Safety

20050188675 Mount Sinai Hospital, Toronto, Ontario Canada
Anti-Cancer Drug Discovery Using Synthetic Lethal Chemogenetic (SLC) analysis
Bellows, David S.; Jul. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0471
Report No.(s): AD-A434327; No Copyright; Avail: CASI; A02, Hardcopy

I am developing a novel cell-based small-molecule screening approach that can identify inhibitors of any non-essential protein function through a surrogate synthetic lethal phenotype in the baker's yeast, Saccharomyces cerevisiae. Synthetic lethality (SL) is a form of genetic enhancement in which two mutations are lethal in combination, but the corresponding individual mutants are viable. Thus, a sensitized yeast strain carrying a mutation that is synthetic lethal with a gene of interest will be inviable in the presence of a chemical inhibitor of the target protein.
DTIC
Cancer; Chemical Reactions; Drugs; Lethality

20050188676 Agency for Healthcare Research and Quality, Rockville, MD USA
Beyond the Dusty Shelf: Shifting Paradigms and Effecting Change
McNeill, Dwight; Holland, Howard; Henriksen, Kerm; Jan. 2004; 12 pp.; In English
Report No.(s): AD-A434328; No Copyright; Avail: CASI; A03, Hardcopy

This paper addresses how to make happen the improvements in the quality of health care that have been identified from significant investments in patient safety research by the Agency for Healthcare Research and Quality (AHRQ). We make the case that the usual supply-side research model is inefficient to produce the health care changes expected from AHRQ. We propose a shift to a demand-side paradigm that engages users throughout the research process, and two models to guide the management of 'action production.' The first model is based on Rogers' model of diffusion of innovations, which indicates that users must absorb a great deal of information in a variety of staged and specific ways in order to make a successful passage from knowledge to action through tactics including awareness, persuasion, adoption, implementation, and confirmation. The second is a decision model, termed distillation, which provides a framework for determining the potential utility and priority of an innovation based on the strength of the science, potential impact, adoptability, and readiness. We address lessons learned from the application of these models to the early implementation experiences of five early outputs from the AHRQ patient safety portfolio. We find that the implementation of the early findings places a strong reliance on information dissemination mostly at the awareness and persuasion stages--efforts directed at the later stages of decision, implementation, and confirmation have been modest. Ongoing evaluation of the impact of these approaches on patient safety practices and quality of care will indicate if the models provide useful guidance in making changes happen.
DTIC
Dust; Management Systems; Medical Services; Patients; Quality; Safety

20050188678 Duke Univ., Beaufort, NC USA

A Likelihood Ratio Classifier for Computer-Aided Diagnosis in Mammography

Bilska-Wolak, Anna O.; Floyd, Carey E., Jr; Jul. 2004; 64 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0015

Report No.(s): AD-A434330; No Copyright; Avail: CASI; A04, Hardcopy

Although screening x-ray mammography has become a very sensitive method for detecting breast cancer, mammography has low specificity in its diagnostic stage. About 67-85% of breast biopsies are performed on benign lesions. Because of cost and detrimental effects of unnecessary biopsies, the number of biopsies performed on benign lesions needs to be reduced. In this research we are developing a highly sensitive and specific computer-aided diagnosis classifier based on the likelihood ratio, which is designed to aid physicians to identify lesions that should not be sent to biopsy.

DTIC

Classifiers; Computer Techniques; Diagnosis; Likelihood Ratio

20050188680 Agency for Healthcare Research and Quality, Rockville, MD USA

Surgical Safety: Addressing the JCAHO Goals for Reducing Wrong-Site, Wrong-Patient, Wrong-Procedure Events

Ludwick, Sandra; May 2005; 11 pp.; In English

Report No.(s): AD-A434332; No Copyright; Avail: CASI; A03, Hardcopy

Under standards set forth by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), health care facilities are required to implement established patient safety goals. The efforts by a team at the Naval Hospital, Cherry Point, NC (NHCP), to address and prevent wrong-site surgery have resulted in an initiative that can easily be implemented within other facilities. After developing a surgical verification checklist, the NHCP wrong-site surgery initiative adopted consistent, facility-wide policies that required staff to ensure that all surgical procedures are done on the right patient and at the right location, and that the correct procedure is performed. A mechanism to measure the effectiveness of the new initiative by recording and tracking data was put into place. Within the first 4 months of implementation, the operating room (OR) had reached its benchmarking goal of 100 percent compliance with surgical verifications. In addition, a simple educational tool displayed in numerous OR and clinic areas serves as a reminder to caregivers and consumers that patient safety is at the top of the NHCP priority list.

DTIC

Errors; Health; Patients; Surgery

20050188683 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Low Level Exposure to Sulfur Mustard: Development of a SOP for Analysis of Albumin Adducts and of a System for Non-Invasive Diagnosis on Skin

Noort, Daan; van der Schans, Govert P.; Dec. 2004; 62 pp.; In English

Contract(s)/Grant(s): DAMD17-02-2-0012

Report No.(s): AD-A434336; No Copyright; Avail: CASI; A04, Hardcopy

In the third year of the grand period, the fluorescence derivatization of the tripeptide S-(2-hydroxylethylthioethyl)-Cys-Pro-Phe (S-HETE)Cys-Pro-Phe was investigated; the 5/6-carboxyfluoresceine (FAM) derivative of the tripeptide (S-HETE)Cys-Pro-Phe has been prepared. When spiked pronase digests were subjected to derivatization with FAM succinimidyl ester, the FAM-tripeptide could be detected in the digest, albeit after prior clean-up by reversed-phase HPLC. Unfortunately, the FAM-tripeptide could not be determined in a pronase digest of albumin isolated from a highly exposed blood sample. With regard to the most abundant adduct, i.e., the histidine adduct, attempts to isolate the histidine adduct by means of reversed-phase HPLC were not successful yet. A definitive SOP for the tripeptide assay was drafted. The inter-individual and intra-individual variation of the in vitro sensitivity of human blood to sulfur mustard was determined, following the albumin-tripeptide (HETE-Cys-Pro-Phe) SOP. Furthermore, the day-to-day variability was determined. The SOP for the tripeptide adduct has been demonstrated to a scientist of USAMRICD, in an independent institute. The method could be set up within one day and the scientist of USAMRICD was able to perform the entire assay on his own after 2 days.

DTIC

Adducts; Albumins; Diagnosis; Exposure; Sulfur

20050188684 Air Force Research Lab., Wright-Patterson AFB, OH USA

Across-ear Interference from Parametrically Degraded Synthetic Speech Signals in a Dichotic Cocktail-party Listening Task

Brungart, Douglas S.; Simpson, Brian D.; Darwin, Christopher J.; Arbogast, Tanya L.; Kidd, Gerald, Jr; Jan. 2005; 17 pp.; In English

Contract(s)/Grant(s): Proj-2313

Report No.(s): AD-A434337; AFRL-HE-WP-JA-2005-0012; No Copyright; Avail: CASI; A03, Hardcopy

Recent results have shown that listeners attending to the quieter of two speech signals in one ear (the target ear) are highly susceptible to interference from normal or time-reversed speech signals presented in the unattended ear. However, speech-shaped noise signals have little impact on the segregation of speech in the opposite ear. This suggests that there is a fundamental difference between the across-ear interference effects of speech and nonspeech signals. In this experiment, the intelligibility and contralateral-ear masking characteristics of three synthetic speech signals with parametrically adjustable speech-like properties were examined: (1) a modulated noise-band (MNE) speech signal composed of fixed-frequency bands of envelope-modulated noise; (2) a modulated sine-band (MSB) speech signal composed of fixed-frequency amplitude-modulated sine waves; and (3) a 'sinewave speech' signal composed of sine waves tracking the first four formats of speech. In all three cases, a systematic decrease in performance in the two-talker target-ear listening task was found as the number of bands in the contralateral speech-like masker increased.

DTIC

Auditory Signals; Ear; Signal to Noise Ratios; Sine Waves; Speech Recognition

20050188685 Agency for Healthcare Research and Quality, Rockville, MD USA

Cost Effectiveness of a Multifaceted Program for Safe Patient Handling

Siddharthan, Kris; Nelson, Audrey; Tiesman, Hope; Chen, FangFei; Jan. 2005; 13 pp.; In English

Report No.(s): AD-A434340; No Copyright; Avail: CASI; A03, Hardcopy

Objective: The patient Safety Center in the Veterans Health Administration (VHA) introduced a program aimed at reducing the incidence and severity of injury to caregivers in handling patients. The program involved an ergonomic assessment protocol, patient handling technology, decision algorithms to select equipment, and guidelines for safe patient handling. Method: An 18-month observational study measured the incidence and severity of injury to caregivers before and after the introduction of the Safe Patient Handling and Movement project. Results and conclusion: This program aided both patients and nursing personnel (registered nurses, licensed practitioner nurses, and nursing assistants). Incidence and severity of injuries to health care workers decreased, and there was general satisfaction with use of equipment by patients and patient handlers. the intervention also was cost effective. A cost-benefit analysis showed that net benefits from lowered incidence and severity of injuries and decreased workers' compensation claims was $200,000 per year. The payback period of the initial investment in patient handling equipment was 4.30 years. Policy implications are discussed.

DTIC

Cost Effectiveness; Patients

20050188688 Agency for Healthcare Research and Quality, Rockville, MD USA

A New Model of Tracheostomy Care: Closing the Research-Practice Gap

St. Clair, Joel; Jan. 2003; 8 pp.; In English

Report No.(s): AD-A434345; No Copyright; Avail: Defense Technical Information Center (DTIC)

Performance improvements have brought about fundamental changes in the past year at Walter Reed Army Medical Center (WRAMC), where a concerted effort is underway to put current research into clinical practice. Tracheostomy care and suctioning became the pilot procedure for these changes in November 2002. What began as a unit-level initiative quickly developed into a Department of Nursing project. The focus of the project is adapting the hospital's existing performance improvement model to better facilitate evidence-based practice. Initial surveys on tracheostomy care conducted throughout the hospital showed an inconsistent level of knowledge and variation in clinical practice. The inconsistencies represented a patient safety threat in the form of nosocomial infections, prolonged hospitalizations, airway complications, and even death. To address these issues, the Nursing Performance Improvement and Nursing Research Departments entered into a research collaboration. Representatives form these departments worked with clinical experts to develop a plan and timeline for conducting a tracheostomy care project with the goal of implementing evidence into practice and thereby improving patient safety at the hospital. The group completed initial data collection in April 2003 and then began work on the evidence-based procedure. A literature review was completed using online search engines such as MEDLINE(Registered), the Cochrane Index to Nursing and Allied Health Literature (CINAHLRegistered), the Cochrane Collaboration, Medscape(Registered), the

American Association of Critical-Care Nurses (AACN) practice guidelines, and the Joanna Briggs Institute. Pertinent articles were identified and evaluated by two independent reviewers. The Agency for Healthcare Research and Quality (AHRQ) levels of evidence were used to grade more than 30 articles.
DTIC
Clinical Medicine; Hospitals; Medical Science

20050188689 Reading Univ., UK
International Hydrogenase Conference (7th) Held at the University of Reading on August 24th to 29th 2004
Aug. 2004; 106 pp.; In English
Contract(s)/Grant(s): FA8655-04-1-5089
Report No.(s): AD-A434346; EOARD-CSP-04-5089; No Copyright; Avail: CASI; A06, Hardcopy
Chemistry of hydrogen oxidation and formation, chemical models and synthetic models, hydrogenase enzyme structure and mechanism, genetics and regulation of hydrogenase systems, hydrogen sensing, hydrogenase assembly and maturation, diversity and evolution of hydrogenases, biotechnology and applications of hydrogenases
DTIC
Conferences; Enzymes; Hydrogen; Reading

20050188691 California Univ., Los Angeles, CA USA
Integrated Massively Parallel Arrays of Stochastic Sensors (IMPASS)
Montemagno, Carlo; Schmidt, Jacob; Jun. 2005; 8 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0394
Report No.(s): AD-A434349; AFRL-SR-AR-TR-05-0216; No Copyright; Avail: CASI; A02, Hardcopy
We report the successful formation of biomimetic polymer membranes approximately 5-6 nm in thickness made from the biomimetic amphiphilic triblock copolymer poly(methyloxazoline)-poly(dimethylsiloxane)-poly(methyloxazoline). We have also successfully inserted a number of membrane proteins (OmpG, MscL, alpha-hemolysin, and alamethicin) into these membranes and demonstrated that these proteins retain their natural function and capabilities. We have found that these membranes exhibit extended lifetimes compared to lipid membranes and on micromachined substrates the lifetime is extended even further (approximately 3 days). As a result of this work, we have found that biomimetic polymer membranes are suitable subjects for further research in membrane protein-based stochastic sensing.
DTIC
Biomimetics; Copolymers; Massively Parallel Processors; Membranes; Parallel Processing (Computers); Proteins; Stochastic Processes

20050188700 Office of the Special Assistant for Gulf War Illness, Falls Church, VA USA
Post Persian Gulf Medical Findings in Military Reservists
Berg, S. W.; Jan. 1994; 46 pp.; In English
Report No.(s): AD-A434359; No Copyright; Avail: CASI; A03, Hardcopy
This paper on post-Persian Gulf War medical findings in military reservists was given at the NIH Technology Assessment Conference on the Persian Gulf Experience and Health 27-29 April 1994 in Bethesda, MD.
DTIC
Persian Gulf; Reserves; Warfare

20050188701 Michigan Univ., Ann Arbor, MI USA
Humanizing the Mouse Androgen Receptor to Study Polymorphisms and Mutations in Prostate Cancer
Robins, Diane M.; Jan. 2005; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0099
Report No.(s): AD-A434360; No Copyright; Avail: CASI; A03, Hardcopy
Androgen receptor (AR) is a critical component in prostrate oncogenesis. AR alleles varying in length of the Nterminal glutamine (Q) tract carry distinct disease risks. Mutation of AR in tumors may influence androgen independence and resistance to treatment. Difficulties studying cancer initiation and progression are partly overcome with transgenic mouse tumor models. However, the mouse AR N-terminus differs significantly from human.
DTIC
Cancer; Hormones; Males; Mice; Mutations; Polymorphism; Prostate Gland; Tumors

20050188703 Agency for Healthcare Research and Quality, Rockville, MD USA
Behind the Scenes: Patient Safety in the Operating Room and Central Materiel Service During Deployments
Vane, Elizabeth A.; Drost, Edward; Elder, Daryl; Heib, Yvonne; Jan. 2005; 15 pp.; In English
Report No.(s): AD-A434362; No Copyright; Avail: CASI; A03, Hardcopy

The USA Army perioperative nurses face unique patient care situations during overseas deployments. In this report, the experiences at the U.S. Army's 28th Combat Support Hospital in Iraq are described. The lessons learned from these situations can assist in patient safety in future operations. The challenges to the nursing staff of performing housekeeping tasks while simultaneously accomplishing a number of other patient care tasks are reviewed. The surgical suite structural requirements for the operating room (OR) and for central materiel service (CMS), and the adaptation of the workflow capabilities through CMS to ensure the best possible sterile products are discussed. Cleaning becomes very difficult in deployed environments because of the mass casualty episodes as well as the relentless wind and sand. The effects of fatigue, sleep deprivation, and stress threaten maintenance of standards and attention to detail. Steam sterilization and glutaraldehyde soaking are useful as sterilization methods when adapted to this harsh environment. With this environment, it was necessary to extend the length of sterilization times, adapt pressure bags to rinse lumens, and realign the work flow to ensure better cleaning and sterilization practices. Cultures of the OR and CMS demonstrated the efficacy of our efforts. Room air exchanges, temperatures, water quality, and other structural requirements were measured on a routine basis and problems were aggressively addressed. The work and traffic flow practices were designed specifically to provide an aseptic environment and functional equipment. Staff safety and well being were given priority in order to maintain standards.
DTIC
Deployment; Patients; Quality Control; Safety; Sterilization; Water Quality

20050188707 Parkinson's Inst., Sunnyvale, CA USA
Large Scale Single Nucleotide Polymorphism Study of PD Susceptibility
Langston, J. W.; Mar. 2005; 9 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0404
Report No.(s): AD-A434369; No Copyright; Avail: CASI; A02, Hardcopy

Although genetic contributions of Parkinson's disease (PD) have gained support from the recent identification of eight genetic loci in the familial PD, the results of intensive investigations of polymorphisms in dozens of genes related to sporadic, late onset, typical PD have not shown consistent results. Recent rapid progress in the investigation of single nucleotide polymorphisms (SNPs) has provided a new tool for this area of research. Millions of SNPs have been identified and compiled in several publicly accessible databases. A highly multiplexed genotyping technology called 'Molecular Inversion Probe Assay' (MIPA) has recently been developed. This technique is capable of genotyping over 2,000 SNPs in a single tube and is currently the least expensive platform for genotyping of SNPs with high call rate and high accuracy. Another major finding in recent genomic studies is that haplotype linkage disequilibrium is composed of blocks of sequence with an average size of 7.8 kb and could be used in associated studies. In this proposal, the authors plan to perform a large-scale association study by using the high throughput MIPA in PD to do the following: (1) investigate the association between classical, sporadic PD and 2,386 SNPs in 23 genes implicated in the pathogenesis of PD; and (2) construct haplotypes based on the SNP genotyping results to identify haplotypes associated with PD. This proposal is the first large-scale SNP association study in PD. The results of this study may lead to a better understanding of the pathogenesis of the disease and possible new therapeutic approaches. In addition, experiences derived from this study may be applied to other complex disorders for the identification of susceptibility genes, as well as in genome-wide SNP association studies.
DTIC
Diseases; Genes; Genetics; Medical Science; Nucleotides; Polymorphism

20050188710 Agency for Healthcare Research and Quality, Rockville, MD USA
Institutional Review Board Approval of Practice-Based Research Network Patient Safety Studies
Graham, Deborah G.; Pace, Wilson; Kappus, Jennifer; Holcomb, Sherry; Galliher, James M.; Duclos, Christine W.; Bonham, Aaron J.; Jan. 2005; 14 pp.; In English
Report No.(s): AD-A434379; No Copyright; Avail: CASI; A03, Hardcopy

Institutional review board (IRB) approval of research that involves the collection of medical error reports is a major challenge. The process includes issues of confidentiality, privacy, discoverability, informed consent, and Web site security. The challenges are more complex for multisite research. This paper describes the approaches taken by the American Academy of Family Physicians (AAFP) and the University of Colorado (CU) to address the challenges and barriers created by the IRB approval process for multisite patient safety research studies. Between 2001 and 2004, the AAFP and CU conducted several

patient safety studies involving primary care practices in three practice-based research networks (PBRNs). The AAFP conducted two pilot studies in 18 primary care clinics in which error reports were submitted by physicians, staff, and patients. The AAFP sought approval from 15 different IRBs for these studies. CU conducted a 3-year project that collected medical errors from 38 primary care practices affiliated with seven separate IRBs. AAFP successfully obtained approval from all 15 IRBs. Several sites required approval from risk management and legal departments. CU obtained approval for the primary study from seven IRBs and two hospital research committees. Secondary studies required additional approvals. Overall, the two projects had a high level of success in obtaining IRB approval. There was great variation in submission requirements, level of review, length of time to obtain approval, and required revisions. PBRN research often includes atypical, multisite research activity, with practices simultaneously serving as research subjects and investigators. The high-risk nature of patient safety work further complicates this situation. Investigative work with the Office for Human Research Protections and the Agency for Healthcare Research and Quality to create a central IRB process could greatly facilitate work of this nature.
DTIC
Medical Science; Patients; Safety

20050188712 Children's Hospital of Pittsburgh, Pittsburgh, PA USA
Pharmacological and Nonpharmacological Methods of Treatment for Fragile X Syndrome
Perlmutter, David H.; Feb. 2005; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0057
Report No.(s): AD-A434383; No Copyright; Avail: CASI; A02, Hardcopy

Fragile X (FX) syndrome causes behavioral disturbances such as labile mood, anxiety, hyperactivity, and aberrant behavioral responses to stress. Affected males may suffer from learning disabilities, attention deficit disorders, mental retardation, or autism spectrum disorders. We seek to address the most effective methods of treatment (pharmacological and behavioral) for the symptoms and behavioral problems associated with FX syndrome. During the past year, we have established a comprehensive FX syndrome clinic and we continue to refine our treatment protocol. Collaborative relationships have been established with genetics, speech/language, psychiatry, and dental so that families can obtain these services from specific professionals with an interest in FX syndrome. School liaison services for school aged youth with FX syndrome have been established. Community education programs, in the form of a website, a parent advisory group, and newsletters have been established. We continue to refine our database to track the frequency of the disease and specific symptoms with the goal of guiding future treatment through evidence based medicine.
DTIC
Abnormalities; Anxiety; Genetics; Pharmacology; Signs and Symptoms

20050188713 New South Wales Univ., Sydney, Australia
Formulated Delivery of Enzyme/Pro-Drug and Cytokine Gene Therapy to Promote Immune Reduction of Treated and Remote Tumors in Mouse Models of Prostate Cancer
Russell, Pamela; Jan. 2005; 55 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0107
Report No.(s): AD-A434387; No Copyright; Avail: CASI; A04, Hardcopy

Prostate cancer is the second highest cause of cancer death in men in Western society. Early disease is treatable by surgery or radiation, but once late stage disease becomes refractory to hormone removal, patient care is limited to pain management. New treatments are needed, We use gene therapy, alone and in combination with hormones called cytokines that stimulate the immune system. The concept is that delivering a cell-killing agent to an accessible tumor, coupled with help from the immune system can promote tumor reduction both at the treatment site and at remote locations. In this therapy, a gene (a fusion of cytosine deaminase and uracil phosphoribosyltransferase (CD/ UPRT) is delivered to a cancer cell by a lentivirus so that harmless bacterial proteins are made. When followed by a pro-drug, 5 fluorocytosine (5FC), cancer cells that make CD/UPRT convert 5FC to a toxin that kills the original and neighboring cells. This system works in slow growing tumors like prostate cancer. Killing the tumor cells attracts immune cells. We are identifying these and then delivering cytokine genes that attract more immune cells into the tumors. We will deliver the cytokine gene alone or with the suicide gene because in other studies, combination therapy works better.
DTIC
Cancer; Drugs; Enzymes; Gene Therapy; Immunity; Mice; Prostate Gland; Tumors

20050188716 Georgetown Univ. Hospital, Washington, DC USA
Modulation of Anaplastic Lymphoma Kinase Upon Tumor-Stroma Interaction and Its Implications for Tumor Growth and Metastasis in Breast Cancer
Stoica, Elly-Gerald; Sep. 2004; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0678
Report No.(s): AD-A434390; No Copyright; Avail: CASI; A03, Hardcopy

Induction of neovascularization is needed for a growing tumor as well as for its metastasis. Angiogenic and growth promoting factors like Pleiotrophin (PTN) act on endothelial and epithelial cells and on fibroblasts. We identified the receptor for PTN as anaplastic lymphoma kinase (ALK). In individual tissues the presence of ALK is elevated in tumor stroma (endothelium) while adjacent normal tissue lacked ALK. In cultured endothelial cells or human fibroblasts ALK is upregulated in response to supernatants from human breast cancer cells. Our hypothesis is that ALK from stromal cells., upregulated in response to factors from tumor cells, constitutes as marker and a potential therapeutic target in breast cancer. We will investigate the specificity of ALK modulation in tumor stroma versus normal endothelium in response to growth factors and breast cancer cell lines supernatants. Also, we will determine the functional effects of the differences in ALK signaling and uncover the differences in drug sensitivity in cells that have an increased ALK level versus untreated. We expect a lowering of the effective dose thus lowering the side effects of these drugs. The completion of the study will translate in establishing ALK as a new target for the breast metastatic cancer therapy.
DTIC
Breast; Cancer; Mammary Glands; Metastasis; Modulation; Tumors

20050188720 Georgetown Univ., Washington, DC USA
Periscopic Spine Surgery
Cleary, Kevin R.; Mar. 2005; 91 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9022
Report No.(s): AD-A434394; No Copyright; Avail: CASI; A05, Hardcopy

This project is aimed at improving the state of the art of image-guided and minimally invasive procedures by developing a new generation of clinical techniques along with the computer-based hardware and software needed for their implementation. The focus of the project is to develop physician assist systems incorporating robotics, tracking, and visualization to improve the precision of instrument placement and manipulation in minimally invasive procedures. The project is led by the Imaging Sciences and Information Systems (ISIS) Center of the Department of Radiology at Georgetown University.
DTIC
Spine; Surgery

20050188726 Army War Coll., Carlisle Barracks, PA USA
Joint Medical Command -- Do It Now
Kumpula, Darwin D.; Mar. 2005; 35 pp.; In English
Report No.(s): AD-A434405; No Copyright; Avail: CASI; A03, Hardcopy

The Army is transforming into a modular expeditionary force while at war. Uniformed medical professionals are doing wonderful work of saving lives and helping rehabilitate the nation's most valuable asset: Soldiers. However, the Army's ability to do this in the future may be in jeopardy if it does not transform as swiftly as the warfighters. The U.S. military environment is swiftly moving toward joint interoperability and joint interdependability. The three service medical departments of the Army, Navy, and Air Force collaborate on issues, but it is a long process centered on their specific service interests. This limited collaboration must be changed to ensure that Soldiers on future battlefields are assured lifesaving care. Presently, each service independently constructs a force to provide medical support. It is in the Army's best interest to structure its assets with the other services for interoperability and interdependence. The Joint Medical Command will reduce redundancies, conserve resources, and implement efficient collaboration among the services. This jointness has been proposed many times since World War II. The time has come to make this commitment for the future of medical health services in the Department of Defense, thereby ensuring superior medical support to the next generation of Soldiers.
DTIC
Interoperability; Medical Services; Military Operations

20050188732 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Operating Room Telephone Microbial Flora
Nelson, J.; Bivens, A.; Shinn, A.; Wanzer, L.; Kasper, C. E.; McIlwain, K.; Bruton, J.; Bibb, S.; Jun. 2005; 32 pp.; In English
Report No.(s): AD-A434435; CI04-1105; No Copyright; Avail: CASI; A03, Hardcopy

There are approximately 500,000 surgical site infections per year in the United states. The purpose of this study was to determine if the bacteria most frequently involved in Surgical Site Infections (SSI) could be found on telephones in the Operating Room (OR). A total of 26 cultures were taken from telephones within 14 operating rooms and two sub-sterile rooms at a large teaching medical center. Bacteria were identified using standard laboratory procedures. The following bacteria were identified: Acinetobacter calcoaceticus-baumannii complex 1.9%, Pseudomonas aeruginosa 1.9%, Agrobacterium radiobacter/tumefaciens 1.9%, Coagulase-negative Staphylococcus 82.7%, Micrococcus 3.8% and Streptococcus non-group D 5.8%. OR telephones can serve as reservoirs for SSI causing bacteria.
DTIC
Bacteria; Infectious Diseases; Microorganisms; Plants (Botany); Pseudomonas; Rooms; Telephones

20050188738 Agency for Healthcare Research and Quality, Rockville, MD USA
Improving the Safety of Heparin Administration by Implementing a Human Factors Process Analysis
Harder, Kathleen A.; Bloomfield, John R.; Sendelbach, Sue E.; Shepherd, Michele F.; Rush, Pam S.; Sinclair, Jamie S.; Kirschbaum, Mark; Burns, Durand E.; Jan. 2005; 11 pp.; In English
Report No.(s): AD-A434461; No Copyright; Avail: Defense Technical Information Center (DTIC)

Heparin administration errors can have severe consequences for patients. Despite a previous attempt to standardize the heparin administration process through the use of a computerized protocol at a large Midwestern hospital, errors still occurred at unacceptably high rates. A Heparin Error Reduction Workgroup (HERW) consisting of staff nurses, pharmacists, and a cardiologist was convened in 2002 to address the issue. The HERW asked human factors consultants to conduct a human factors process analysis of the nursing staff s heparin administration procedures. The consultants observed the work process involving heparin administration in several nursing stations and conducted interview sessions with (1) the physician and pharmacist who developed the heparin protocols; (2) staff pharmacists; (3) nursing administrators; (4) nurse educators; and (5) nurses from cardiovascular nursing stations where heparin is administered extensively, and medical/surgical nursing stations where it is used less frequently. After analyzing the information collected in the interviews and observations, the consultants recommended changes to make the computerized heparin dosing interface more user-friendly, for example, presenting no more than three responses per computer screen to the practitioner, and automatically interconverting English and metric weight and height measurements. The HERW approved and implemented many of the recommendations. The revised heparin dosing computer interface was then tested by a representative sample of nurses and pharmacists from all areas of the hospital. Further modifications were made based on feedback from the participants in the test. A 5-day educational process was then instituted to inform practitioners about the new heparin administration procedure. Following the education, the upgraded computer-driven procedure was implemented hospitalwide. This new procedure has been very well received by the nurses who administer heparin.
DTIC
Heparins; Human Factors Engineering; Safety

20050188741 Case Western Reserve Univ., Cleveland, OH USA
Prostatic Fluid Cells
Pretlow, Thomas G.; Apr. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0039
Report No.(s): AD-A434468; No Copyright; Avail: CASI; A02, Hardcopy

Most research that requires long-term propagation of prostate cancer (PCA) cells is carried out with three cell lines: DU 145, PC-3, and LNCaP. All but one of these lines, LNCaP, fail to express prostate-specific antigen (PSA), androgen receptors, and/or any other prostate phenotype. Some prostatic fluids contain prostate cancer cells. The goals of this research were as follows: (1) to test the tumorigenicity of, and to develop transplantable xenografts from, PCA cells in prostatic fluid; (2) to develop methods for enhancing the tumorigenicity of small numbers of these PCA cells without deliberately altering their genes; (3) to test these methods for enhancement of tumorigenicity with prostatic fluid cells; and (4) to initiate clinical followup. As detailed in the body of the report, the aims of the research have been limited by exceptionally weak clinical collaboration that has become progressively weaker. The fluids that the author tested earlier were promising, but samples tested in the past year have been quite inadequate. Co-injection of lethally irradiated, growth-factor-producing cells was encouraging in some experiments with some tumors, but results were quite variable in repeated experiments. The inadequacies

in fluid samples and the repeatability of experiments are detailed in this report. The author concludes that, prostate cancer cells from prostatic fluids of a significant proportion of patients with primary prostate cancers can survive for a few months in nude mice, and they do not grow rapidly enough to form transplantable xenografts with the technology that is currently available.
DTIC
Body Fluids; Cancer; Prostate Gland; Transplantation; Tumors

20050188742 Cold Spring Harbor Lab., New York, NY USA
Searching the Epigenome for Novel Breast Cancer Tumor Suppressor
Hannon, Gregory J.; Sep. 2003; 12 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0345
Report No.(s): AD-A434469; No Copyright; Avail: CASI; A03, Hardcopy

The initial proposal focused on developing technologies to uncover epigenetic changes that contribute to tumor development. The authors' initial attempts towards developing genome-wide approaches to identifying new genes silenced by epigenetic mechanisms encountered problems. However, their efforts to exploit epigenetic mechanisms of gene silencing to study tumor suppressor gene function have been very successful. Therefore, as they enter the second year of funding, they plan to capitalize on the success of the latter experiments in refocusing their efforts. Their new objectives will build upon the unanticipated advances that they have made in the use of RNAi to manipulate gene expression in mouse and human cell systems and in animal models to explore the role of epigenetic modifications in breast cancer progression. This report presents key accomplishments in the following areas: control of cellular senescence and the silencing of E2F target genes, analysis of the CBX7 oncogene, use of ribonucleic acid interference (RNAI) to suppress gene expression and produce tumor phenotypes in mice, and RNAI libraries and other new tools.
DTIC
Breast; Cancer; Genes; Mammary Glands; Ribonucleic Acids; Suppressors; Tumor Suppressor Genes; Tumors

20050188743 State Univ. of New York, Buffalo, NY USA
Integrating Geographic Information System (GIS) into Breast Cancer Epidemiologic Research
Han, Daikwon; Jul. 2004; 24 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0475
Report No.(s): AD-A434470; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this postdoctoral research is an integration of Geographic Information Systems (GIS) and a spatio-temporal perspective in breast cancer research. The research focuses on the relationship between environmental exposures and breast cancer risk. With the increased use of GIS in epidemiologic studies, it becomes possible to examine lifetime exposures to environmental risk factors by integrating lifetime exposure information in GIS with other breast cancer epidemiologic factors. As part of an ongoing case-control study of breast cancer in western New York, the proposed study tests the following hypotheses: (1) lifetime cumulative exposure to polycyclic aromatic hydrocarbons (PAHs) and benzene will be more strongly associated with risk for breast cancer than exposure for any one time period; and (2) there will be sensitive periods in a woman's life that will carry greater risk for exposure. The author will develop a GIS-based model of lifetime residential history and environmental exposure to PAHs and benzene. Developing a plan for modeling and development of the data was a major component of the first year's goals. For this year's goal, the author has focused on spatial clustering analyses of residences. He also has completed an update of the lifetime histories of the breast cancer cases and controls for his data set, established a collection of historic traffic information, and developed a GIS-based traffic model. These data will be used in future analyses. The development of a theoretical framework measuring similarities and differences in individuals' lifetime residential histories is in progress. Training in epidemiology was another task. The author has been involved in writing an epidemiologic research paper and has participated in several workshops as part of his epidemiology training.
DTIC
Benzene; Breast; Cancer; Epidemiology; Geographic Information Systems; Hydrocarbons; Mammary Glands

20050188744 Battelle Memorial Inst., Columbus, OH USA
A Medical Research and Evaluation Facility (MREF) and Studies Supporting the Medical Chemical Defense Program
Olson, Carl T.; James, Ryan; Botsford, James; Curtis, Theresa; Doherty, Frank; Lush, Donald; McFadden, Phil; O'Shaughnessy, Thomas; States, Stanley; Shoji, Ryo; Mar. 2005; 24 pp.; In English
Contract(s)/Grant(s): DAMD17-99-D-0010
Report No.(s): AD-A434473; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Army Center for Environmental Health Research (USACEHR), a detachment of the U.S. Army Medical Research Institute of Chemical Defense, in collaboration with Battelle, has recently evaluated the use of 10 sensor technologies for rapid identification of toxicity in drinking water. The objective was to evaluate the ability of these sensors to respond rapidly (in less than an hour) to the presence of 12 industrial and agricultural chemicals. USACHER coordinated the participation of laboratories with applicable sensor technologies and, together with Battelle, developed an experimental plan, managed the preparation and distribution of the contaminant solutions to the contributing laboratories, came to consensus with the laboratories on how to perform the sample analysis and data reporting, and evaluated the results. This report describes the experimental work that was performed and then describes the results obtained from each of the participating sensors. Test results will be used to help select toxicity sensors to be used to evaluate Army drinking water supplies. This activity supports Army Technology Objective IV.ME.2004.03, 'Environmental Sentinel Biomonitor (ESB) System for Rapid Determination of Toxic Hazards in Water'

DTIC

Chemical Defense; Chemical Warfare; Contaminants; Defense Program; Detectors; Medical Science; Potable Water; Sensitivity

20050188745 Fox Chase Cancer Center, Philadelphia, PA USA

Preference and Utilities for Prostate Cancer Screening and Treatment: Assessment of the Underlying Decision Making Process

Watkins-Bruner, Deborah; Jan. 2005; 14 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0055

Report No.(s): AD-A434474; No Copyright; Avail: CASI; A03, Hardcopy

The proposed study will evaluate two different populations, a community sample without prostate cancer, and a group of men diagnosed and treated for prostate cancer. The study is designed to evaluate the decision-making mechanism (i.e., risk-attitude versus risk-perceptions) and processes)i.e., cognitive versus affective) that influence their preferences for specific treatments (e.g. , surgery and radiotherapy) and associated health states (i.e., sexual impotence and urinary incontinence). In order to assess risk-attitude versus risk-perception two variables must be considered, the point of reference of the subject (i.e., person with prostate cancer versus person without prostate cancer) and the way the treatment alternatives are communicated or framed (loss-framed message versus gain-framed message).

DTIC

Cancer; Decision Making; Medical Science; Populations; Prostate Gland; Utilities

20050188746 Federation of American Scientists, Washington, DC USA

Biomedical Requirements for High Productivity Computing Systems

Howell, Kay; Higgins, Gerry; Apr. 2005; 122 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-02-1-0117; DARPA ORDER-N353; Proj-BR4H

Report No.(s): AD-A434479; AFRL-IF-RS-TR-2005-160; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report details biomedical computing requirements for high productivity computing systems for DARPA's High Productivity Computing Systems (HPCS) program. The goal of the project was to determine biomedical computing requirements in order to define the size and nature of the demand in this research field; provide an assessment of the impact HPCS technologies can have on important biomedical problems and highlight HPCS R&D areas critical to advances in biomedical computing. The study team used multiple techniques to gather, assimilate and validate biomedical computing requirements including: a review of biomedical computing needs in the literature, interviews with government and industry researchers, and a workshop to identify software environment requirements.

DTIC

Biomedical Data; Computer Programs; Computers; Information Systems; Medical Science; Productivity; Requirements

20050188747 McGill Univ., Montreal, Quebec Canada

Mesenchymal Stem Cells for Vascular Target Discovery in Breast Cancer-Associated Angiogenesis

Galipeau, Jacques; Sep. 2004; 44 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0633

Report No.(s): AD-A434480; No Copyright; Avail: CASI; A03, Hardcopy

Cancer growth and spread is dependent on new blood vessel formation, i.e. angiogenesis. A tumor mass cannot develop

into a life-threatening condition without angiogenesis. Obstructing the recruitment of new blood vessels to the tumor through administration of antiangiogenic agents will hinder cancer progression. We propose the use of marrow stromal cells (MSCs) for an investigative gene discovery program to identify new genes involved in blood vessel formation. MSCs, a normal cell type from the bone marrow, can spontaneously turn into blood vessels (MSC-mediated vasculogenesis) in experimental animals. Therefore, we propose the MSCs recapitulate the ontogeny of blood vessel formation and serve to identify novel angiogenesis promoters and potential new pharmacological targets. To test this hypothesis, we will utilize a cell biology and molecular genetic experimental approach. Products thus identified as involved in MSC-mediated vasculogenesis may become new cancer 'antiangiogenesis' target for either a classic pharmacological approach or for cell and gene therapy therapeutic strategies. The utilization of antiangiogenic agents for cancer treatment holds certain advantages over chemotherapeutic drugs, such as the destruction uniquely of tumor-associated normal blood vessels and not of other normal tissue such as bone marrow. Also, unlike chemotherapy, drug resistance is not an issue with antiangiogenic compounds.
DTIC
Angiogenesis; Breast; Cancer; Cardiovascular System; Mammary Glands; Stem Cells; Target Recognition

20050188748 Massachusetts General Hospital, Boston, MA USA
An Analysis of Rho-PKN Signaling in Prostate Cancer Using Drosophila Genetics
Betson, Martha E.; Jan. 2005; 13 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0141
Report No.(s): AD-A434481; No Copyright; Avail: CASI; A03, Hardcopy

The mechanisms underlying the development and progression of prostate cancer are poorly understood. In addition there are few markers available for the diagnosis of this disease. In an attempt to shed light on mechanisms of prostate cancer progression and identify novel markers, I am focusing my research on protein kinase N (PKN). This protein has been implicated in prostate cancer: levels of PKN protein are upregulated in prostate cancer, PKN binds the androgen receptor (a key protein in prostate cancer progression) and promotes androgen receptor-dependent transcription. The specific aims of my project are to investigate the involvement of PKN family proteins in prostate cancer, and to identify and characterize novel components in the PKN signaling pathway. To fulfill these aims I am attempting to knock down expression of PKN and the closely related protein kinase C related kinase 2 in cell lines and look at the effects of knock down on cellular processes involved in tumorigenesis. In addition, I am using the fruit fly Drosophila melanogaster as a tool to identify new proteins in the PKN signaling pathway, since the fly has a well-conserved PKN gene and many signaling pathways operating in cancer are conserved between flies and humans.
DTIC
Cancer; Drosophila; Enzymes; Genetics; Phosphorus; Prostate Gland; Proteins

20050188754 California Univ., Davis, CA USA
Modulation of Apoptosis-Associated and DNA Repair Genes to Enhance Radiation Therapy
Gumerlock, Paul H.; Feb. 2005; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0171
Report No.(s): AD-A434487; No Copyright; Avail: CASI; A02, Hardcopy

Of the approximately 220,900 men in the USA diagnosed with carcinoma of the prostate (CaP) in 2003, approximately eighty-five percent presented with presumed localized disease for which external beam radiation therapy (EBRT) was one of the few treatment options. While it is relatively effective, the failure rate still remains unacceptably high with a 5-year biochemical failure rate of 10-40%. The curative potential of radiation therapy still remains to be maximized. Genes that may be critical in controlling radiosensitivity are several that function in the G2 cell cycle phase arrest checkpoint after cellular radiation damage, and DNA damage repair mechanisms. p53 is a tumor suppressor gene that has a crucial role in the molecular pathway following genotoxic insult. It encodes a DNA-binding protein that transactivates genes that either influence survival through cell cycle arrest and DNA damage repair, or signal apoptosis in extensively damaged cells. Using a model system in which p53 function was conditionally restored to a p53-null PC3 prostate cancer cells by stable transfection with a human CaP-derived temperature-sensitive p53 (tsp530 mutant allele, we have shown that functional p53 significantly increased clonogenic survival (p \h 0.01) following exposure to daily doses of 2 Gy IR, and contributed to a more sustained G2 arrest and increased G1 arrest in response to the multi-fraction regimen. These studies implicate the presence of wild-type (wt) p53 with increased survival of CaP cells following fractionated exposure to radiation, suggesting that wt p53 in prostate tumor cells, found in approximately 65% of primary prostate cancers, may reduce the effectiveness of radiation therapy.
DTIC
Apoptosis; Cancer; Deoxyribonucleic Acid; Genes; Modulation; Prostate Gland; Radiation Damage; Radiation Therapy; Therapy

20050188755 Cancer Therapy and Research Foundation, San Antonio, TX USA

Predictive Biomarkers of Response to Bc1-2 Biomodulation by G3139 and Docetaxel in Hormone-Refractory Prostate Cancer

Tolcher, Anthony W.; Jan. 2005; 19 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0047

Report No.(s): AD-A434488; No Copyright; Avail: CASI; A03, Hardcopy

The specific aims of this grant are to demonstrate (1) that bcl-2 overexpression in prostate cancer specimens is a predictive biomarker for enhanced responsiveness to G3139 (oblimersen), and antisense oligonucleotide targeting Bcl-2, and docetaxel; (2) that the degree of bcl-2 downregulation in normal tissue surrogate (peripheral blood mononuclear cells MNC), will predict prostate cancer responsiveness to oblimersen and docetaxel; and (3) whether the pharmacokinetic parameters of oblimersen and docetaxel are predictive of bcl-2 biomodualtion and antitumor activity, respectively. Oblimersen steady-state concentrations are a predictive determinant of PSA response to the combination of oblimersen and docetaxel in patients with hormone-refractory prostate cancer. Although the majority of patients had marked decrements in Bcl-2 protein expression in MNCs following treatment with oblimersen, there was no relationship between the decrement in bcl-2 expression in MNC and response to therapy or Oblimmersen Css. Bcl-2, Bax and Bcl-X expression in the patient's original tumor block specimens was not predictive of response to therapy with oblimersen and docetaxel. Oblimersen Css is a significant predictor of PSA response to therapy with this combination. Oblimersen at the current recommended dose of 7 mg/kg/day in solid tumor studies may provide inadequate Css for a significant proportion of patients treated that may lead to suboptimal effectiveness in some clinical studies.

DTIC

Apoptosis; Biomarkers; Cancer; Hormones; Predictions; Prostate Gland; Refractories

20050188756 Texas Univ., Dallas, TX USA

Analysis of Morphogenic Effect of hDAB2IP on Prostate Cancer and its Disease Correlation

Hsieh, Jer-Tsong; Feb. 2005; 99 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0222

Report No.(s): AD-A434489; No Copyright; Avail: CASI; A05, Hardcopy

It is known that prostate cancer (PCa) acquires its malignant phenotypes by losing the ability to differentiate into mature cells. Therefore, restoration of the normal differentiated phenotype in AIPCa certainly can suppress the progression of PCa, which offers a new therapeutic strategy for PCa treatment. Using molecular biologic approaches, our laboratory was able to unveil an altered genetic make-up that is involved in cell differentiation in normal prostatic epithelium. Data from our laboratory has documented the potential role of this novel gene, hDAB2IP, in the cell differentiation of normal prostatic epithelia. In PCa, hDAB2IP is often down regulated. Thus, we proposed to study the underlying mechanism leading to the loss of hDAB2IP gene expression. In addition to the genetic mutations of tumor suppressor genes associated with PCa, recent data clearly indicated that epigenetic alterations are also involved in this silencing. In this study, we have shown that both histone methylation and histone deacetylation play an important part in silencing hDAB2IP gene expression and this event is mediated by a poplycomb group transcription complex Ezh2. The outcome of this study provides a bettter understanding of the fundamental changes between normal prostatic basal/stem cell and AIPCa, and further lead to the development of a novel and more effective intervention for this disease.

DTIC

Cancer; Diseases; Prostate Gland

20050188757 Michigan Univ., Ann Arbor, MI USA

Acquired Tamoxifen Resistance and Overexpression of Anti-Apoptotic Molecules: A Potential Strategy for Overcoming Endocrine Resistance

Lippman, Marc; Xu, Liang; Feb. 2005; 13 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0564

Report No.(s): AD-A434491; No Copyright; Avail: CASI; A03, Hardcopy

The major goal of this Concept Award project is to investigate whether a small molecule inhibitor of Bcl-xL will be able to overcome the chemo- and endocrine-resistance in breast cancer. we have investigated the in vitro and anti-tumor activity of (-)-gossypol, a potent small molecule inhibitor of Bcl-XL, and the potential synergistic effects of (-)-gossypol in combination with chemodrugs and Tamoxifen in breast cancer cell lines. (-)-gossypol showed potent anti-tumor activity to human breast cancer cell lines with high levels of Bcl-XL, but has only minimal effect on human normal breast epithelial cells with low Bcl-xL. (-)-gossypol potently enhanced growth inhibition by doxorubicin and docetaxel, currently used

chemotherapeutic agents for breast cancer, both in vitro and in vivo. However, (-)-gossypol did not show significant enhancement of Tamoxifen activity in Er(+) breast cancer MCF-7 and T47D cells. Bcl-xL knockdown by siRNA abolished the tumorigenecity of MCF-7 cells. The data support that Bcl-xL plays a critical role in breast cancer initiation, progression and chemoresistance, but its role in endocrine resistance remains to be further elucidated. The study provide us a solid foundation to develop (-)-gossypol as a novel molecular targeted therapy for the treatment of breast cancer with Bcl-xL overexpression.
DTIC
Apoptosis; Breast; Cancer; Endocrinology; Inhibitors; Mammary Glands

20050188758 Mayo Clinic, Scottsdale, AZ USA
Interaction of the MUC1 Tumor Antigen and the Adenomatous Polyposis Coli Tumor Suppressor in Human Breast Cancer
Hattrup, Christina L.; Mar. 2005; 14 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0300
Report No.(s): AD-A434493; No Copyright; Avail: CASI; A03, Hardcopy
This project examines the interaction of MUC1, a breast tumor antigen, with APC, a potent tumor suppressor. We have focused on Task 4 in the approved Statement of Work: 'To clarify the functional significance of the interaction in relation to b-catenin and ErbB signaling'. TO this end, we have determined that APC most likely interacts preferentially with wildtype MUC1 as compared to a MUC1 mutant lacking tyrosines in the cytoplasmic tail. We have created several constructs to overcome difficulties associated with poor APC antibodies: His (exp-6) and myc-tagged, as well as constructs for tandem affinity purification (TAP) and fluorescence resonance energy transfer (FRET). We have expressed APC in breast cell lines under a zinc-inducible promoter, but have determined that these cells are too inconsistent to use for immunoprecipitations. In another breast cancer cell lines, MDA-MB-468, we have successfully knocked down MUC1 expression using siRNA technology; interestingly, the reduced level of MUC1 correlated with a decrease in active b-catenin in these cells. Our upcoming studies will make use of TAP, FRET, and siRNA as complementary assays in examining the role of the MUC1-APC interaction in human breast cancer.
DTIC
Antigens; Breast; Cancer; Escherichia; Mammary Glands; Mutations; Suppressors; Tumors

20050188762 Agency for Healthcare Research and Quality, Rockville, MD USA
'Near-Miss' Reporting System Development and Implications for Human Subjects Protection
Murff, Harvey J.; Byrne, Daniel W.; Harris, Paul A.; France, Daniel J.; Hedstrom, Christa; Dittus, Robert S.; May 2005; 14 pp.; In English
Contract(s)/Grant(s): 5-M01-RR-000095
Report No.(s): AD-A434516; No Copyright; Avail: Defense Technical Information Center (DTIC)
Reviews of recent research-related fatalities have demonstrated that clinical research system failures likely contributed to the event. Current research safety-reporting mechanisms focus on individual protocols and are therefore less likely to detect system-level failures. The authors have implemented the 'near-miss' reporting system for a general clinical research center to detect latent failure within the research environment. An identified research-related near-miss includes a research volunteer being mistakenly directed into an incorrect protocol. Before beginning the incorrect study, the participant recognized that the protocol did not coincide with the consent document and the error was detected without harm. Lack of both reliable research-participant tracking and verification programs was believed to be an important latent failure associated with the research unit. Collecting research unit-specific information on potential safety concerns could identify system failures that might not be identifiable through traditional human subject protection programs.
DTIC
Human Beings; Medical Science; Protection; Research Management; Safety; Systems Analysis; Systems Engineering

20050188766 Wyle Labs Life Science and Services, Inc., San Antonio, TX USA
Decompression Sickness During Simulated Extravehicular Activity: Ambulation vs. Non-Ambulation
Webb, James T.; Beckstrand, Devin P.; Pilmanis, Andrew A.; Balldin, Ulf I.; May 2005; 5 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-6472; Proj-7184
Report No.(s): AD-A434520; AFRL-HE-BR-JA-2005-0028; No Copyright; Avail: CASI; A01, Hardcopy
Extravehicular activity (EVA) is required from the International Space Station on a regular basis. Because of the

weightless environment during EVA, physical activity is performed using mostly upper-body movements since the lower body is anchored for stability. The adynamic model(restricted lower-body activity; non-ambulation) was designed to simulate this environment during earth-bound studies of decompression sickness (DCS) risk. DCS symptoms during ambulatory (walking) and non-ambulatory high altitude exposure activity were compared. The objective was to determine if symptom incidence during ambulatory and non-ambulatory exposures are comparable and provide analogous estimates of risk under otherwise identical conditions. A retrospective analysis was accomplished on DCS symptoms from 2010 ambulatory and 330 non-ambulatory exposures. There was no significant difference between the overall incidence of DCS or joint pain DCS in the ambulatory (49% and 40%) vs. the non-ambulatory exposures (53% and 36%; P.0.1). DCS involving joint pain only in the lower body was higher during ambulatory exposures (28%) than non-ambulatory exposures (18%; P.0.1). Non-ambulatory exposures terminated more frequently with non-joint-pain DCS (17%) or upper-body-only joint pain (18%) as compared to ambulatory exposures;9% and 11% (P.0.01) respectively. These findings show that lower-body, weight-bearing activity shifts the incidence of joint-pain DCS from the upper body to the lower body without altering the total incidence of DCS or joint-pain DCS. Use of data from previous and future subject exposures involving ambulatory activity while decompressed appears to be a valid analogue of non-ambulatory activity in determining DCS risk during simulated EVA studies.
DTIC
Decompression Sickness; Extravehicular Activity; Pain

20050188780 Agency for Healthcare Research and Quality, Rockville, MD USA
Language, Literacy, and Communication Regarding Medication in an Anticoagulation Clinic: Are Pictures Better Than Words?
Schillinger, Dean; Machtinger, Edward L.; Wang, Frances; Chen, Lay-Leng; Win, Karen; Palacios, Jorge; Rodriguez, Maytrella; Bindman, Andrew; May 2005; 14 pp.; In English
Contract(s)/Grant(s): PO1-HS10856
Report No.(s): AD-A434541; No Copyright; Avail: Defense Technical Information Center (DTIC)

Despite the importance of clinician-patient communication for safe medication management, little is known about rates and predictors of medication miscommunication. Measuring rates of miscommunication, as well as differences between verbal and visual modes of assessment, can inform efforts to more effectively communicate about medications. The researchers performed a study among long-term warfarin users in an anticoagulation clinic to assess concordance between patient and clinician reports of patient warfarin regimens. Bilingual research assistants asked patients to verbalize their prescribed weekly warfarin regimen, and identify this regimen from a digitized color menu of warfarin pills. The researchers obtained clinician reports of patient regimens from chart review. Patients were categorized as having regimen concordance if there were no patient-clinician discrepancies in total weekly dosage. Quantitative differences in concordance to the regimen were assessed verbally or visually. The researchers then examined whether verbal and visual concordance rates varied with the patient's language and level of health literacy. Fifty percent of patients achieved verbal concordance and 66 percent achieved visual concordance with clinicians regarding the weekly warfarin regimen (P\h0.001). In adjusted models, being a Cantonese speaker and having inadequate health literacy were associated with a lower odds ratio for verbal concordance compared to being an English speaker and having adequate health literacy. Neither language nor health literacy was associated with visual discordance. The authors conclude that clinician-patient discordance regarding patients' warfarin regimen was common, but occurred less frequently when patients identified their regimen with a visual aid. Visual aids may improve the accuracy of medication assessment and may be especially beneficial for patients with communication barriers.
DTIC
Drugs; Education; Languages; Patients; Physicians; Reading; Therapy; Verbal Communication; Visual Aids; Voice Communication; Words (Language)

20050188783 Agency for Healthcare Research and Quality, Rockville, MD USA
Implementing a Systems Engineering Intervention for Improving Safety in Outpatient Surgeries
Carayon, Pascale; Hundt, Ann S.; Alvarado, Carla J.; Springman, Scott; Borgsdorf, Amanda; Jenkins, Lynn; May 2005; 18 pp.; In English
Contract(s)/Grant(s): P20-HS11561-01
Report No.(s): AD-A434544; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper describes the systems engineering intervention the researchers implemented in their study of patient safety in outpatient surgery. The intervention process is based on the SEIPS (Systems Engineering Initiative for Patient Safety) model of work-system and patient safety. The paper provides details on the steps in the intervention process (e.g., overall structure, decision-making criteria for selection of intervention, participants) and the various data collection tools and methods that were

used at each step of the intervention process. The systems engineering intervention process consists of three steps: (1) defining and designing the content and the implementation plan of the intervention, (2) implementing the intervention, and (3) institutionalizing the intervention. Data collection methods used for defining and designing the intervention include an initial employee questionnaire and patient shadowing. An employee questionnaire and a patient survey are the two methods used to evaluate the impact of the systems engineering intervention.
DTIC
Errors; Patients; Prevention; Safety; Surgery; Systems Engineering

20050188787 Brigham and Women's Hospital, Boston, MA USA
Caveolin-1 Modulates Androgen Receptor Signaling in Advanced Prostate Cancer
Lu, Michael L.; Feb. 2005; 38 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0017
Report No.(s): AD-A434550; No Copyright; Avail: CASI; A03, Hardcopy

In the past three years, we identified and preliminarily characterized a novel serine/threonine p21 activated protein kinase 6 (PAK 6) as the key signal mediator in regulating AR signal transduction within caveolae/raft domain. We also demonstrated a cross-talk between the caveolin-1/AR and PI3 kinase/Akt signal pathway in hormone dependent cell survival. Overall, our results established a biochemical basis on the notion that caveolin expression is associated with prostate cancer progression. The 'neoexpression' caveolin in prostate cancer progression represents a gain of function event in cancer survival. These results illustrate the important role of AR non-genomic effect in response to androgen stimulation. Moreover, the identification of a novel serine/threonine PAK6 kinase underscores the relevance of this signal pathway in mediating AR nongenomic effects. Our results support the hypothesis from our original proposal that AR signals from rafts to regulate its transcriptional function. These findings pave the way to further define the underlying signal cross-talk in AR-mediated signaling.
DTIC
Cancer; Hormones; Males; Prostate Gland

20050188789 Children's Hospital of Pittsburgh, Pittsburgh, PA USA
Evaluation of Molecular Inhibitors of the c-Myc Oncoprotein
Prochownik, Edward V.; Feb. 2005; 9 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0226
Report No.(s): AD-A434552; No Copyright; Avail: CASI; A02, Hardcopy

One of the most common molecular abnormalities in human cancers involves over-expression of the c-Myc oncoprotein. By regulating the expression of key cellular genes, c-Myc controls a number of normal biological properties such as cell cycle entry, differentiation, growth, and the decision to die or remain viable. All of these functions require that C-Myc physically associate with another protein. Max. Example of diseases in which c-Myc deregulation occurs include breast cancer (approx. 30% of cases), colon cancer (\g85%), and Burkitt's lymphoma (\g98&). Of relevance to proposal is that at least 25% of prostate cancers are also associated with c-Myc deregulation. Additional evidence suggests that more advanced/aggressive disease may also be more commonly associated with c-Myc over-expression. Because nearly 190,000 men in the USA alone will be diagnosed with prostate cancer this year, and over 30,000 will die, the design of drugs that inhibit c-Myc would appear to be a reasonable approach.
DTIC
Breast; Cancer; Inhibitors; Intestines; Mammary Glands; Molecules; Prostate Gland; Proteins; Tumors

20050188790 Beth Israel Deaconess Medical Center, Boston, MA USA
Trace Elements and the Development of Prostate Cancer
Sytkowski, Arthur J.; Jan. 2005; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0014
Report No.(s): AD-A434553; No Copyright; Avail: CASI; A03, Hardcopy

Selenium is an essential nutrient that may have an important preventive action in prostate cancer. We have identified a human gene in prostate cells, designated hSP56, the mouse homologue of which may mediate selenium's growth inhibitory effect in vitro and anti-cancer effect in vivo. hSP56 is expressed by LNCaP but not by PC-3 and is reversibly downregulated by androgen. We hypothesize that hSP56 protein may play a role in the anti-cancer effects of selenium in the prostate gland. To test this hypothesis we will: 1) study the molecular properties of hSP56 protein, including its binding of selenium, 2) study the role of hSP56 in the prostate cancer phenotype in vitro using gain-of-function and low-of-function approaches, 3)

investigate the effect of overexpression or downregulation of hSP56 on in vivo tumor growth in SCID mice and 4) determine the distribution of hSP56 expression in primary human tumors and in adjacent normal prostate cancer cells. This work will lead to a new understanding of prostate cancer regulation and the role of selenium in normal and malignant prostate growth and spread.
DTIC
Cancer; Hormones; Males; Prostate Gland; Selenium; Trace Elements

20050188792 Wisconsin Univ., Madison, WI USA
Molecular Markers and Prostate Cancer Radiation Response
Ritter, Mark A.; Jan. 2005; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0164
Report No.(s): AD-A434556; No Copyright; Avail: CASI; A03, Hardcopy

Two cohorts of relatively early stage prostate cancer patients, one treated with radiation therapy and the other with surgery have been identified and have been shown to have similar 5-year disease free survivals after treatment. Abnormal p53 protein levels, indicating mutation, are present in a substantial percentage of relatively early stage prostate cancer patients. High levels of p53 protein strongly correlates, both under univariate and multivariate analysis, with higher rates of subsequent PSA failure in patients treated with radiation therapy but not in patients treated with radical prostatectomy indicating a predictive power that has significant specificity of radiation. This study indicates that p53 is a very strong predictor of outcome after radiotherapy but not after surgery in early stage prostate cancer. If pretreatment markers such as p53 that are specific for radiation response can be identified and confirmed in additional clinical trials, their availability could ultimately supplement the medical decision-making process and allow better prospective tailoring of treatment to the biological characteristics of each patient's tumor. For example, a patient predicted to be at high risk for failure specifically after conventional radiotherapy might be better served by surgery or by aggressive dose escalation or perhaps by therapies that targets the identified molecular defect.
DTIC
Cancer; Markers; Prostate Gland; Radiation Effects

20050188793 Cancer Inst. of New Jersey, New Brunswick, NJ USA
Regulation of Drug Sensitivity by Functional Status of p53 in Human Prostate Cancer
Hait, William N.; Jan. 2005; 52 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0081
Report No.(s): AD-A434558; No Copyright; Avail: CASI; A04, Hardcopy

Mulidrug resistance protein MRP1 is overexpressed in advanced stage and grade human prostate cancer and is negatively regulated by p53. We found that antiandrogen flutamide is affected by MRP1 expression. There were significant differences between the sensitive and MRP1-overexpressing cells in efflux and accumulation. Intracellular glutathione depletion with buthionine sulfoximine or energy depletion using 2-deoxy-D-glucose/sodium azide restored flutamide accumulation to that of parental cells. These studies indicate that flutamide and hydroxyflutamide are transported by MRP1 and that these findings may contribute to our understanding of resistance to hormone refractory prostate cancer. We also determined the effect of compounds that alter p53 function on MRP1 expression. We found that chlorpromazine, promazine, and trans-flupenthixol caused a 2-3 fold increase in wild-type p53 conformation and CP-31398 increased wild-type p53 conformation 6-10-fold. Promazine and chlorpromazine increased p21 in a dose-dependent manner. LVCap cells exposed to CP-31398 showed a 5-fold increase in p21 and 10-fold decrease in MRP1. These data suggest that CP-31398 is an effective inducer of p21 expression and MRP1 repression in the prostate cancer cells and that compounds with similar structures and greater activity can be identified.
DTIC
Cancer; Drugs; Glutathione; Prostate Gland; Sensitivity

20050188796 Northwestern Univ., Evanston, IL USA
Immune Cells, If Rendered Insensitive to Transforming Growth Factor-Beta, Can Cure Prostate Cancer
Lee, Chung; Feb. 2005; 16 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0166
Report No.(s): AD-A434561; No Copyright; Avail: CASI; A03, Hardcopy

The objective of the current proposal is to perform immunotherapy to eradicate prostate cancer and at the same time to

avoid the development of autoimmune disease, The proposal contains two tasks. The first task is a combination of IL-2 based tumor-reactive T-cell adoptive therapy with the TGF-beta based gene therapy for the treatment of mouse prostate cancer. The second task is A tetracycline inducible TGF-beta based gene therapy. At the time of this reports, we have completed Task 1 and a paper has been accepted by Cancer Research for publication in its March 1, 2005, issue. Currently, we are in the process of conducting studies described in Task 2.
DTIC
Cancer; Gene Therapy; Prostate Gland; Therapy

20050188808 McGill Univ., Montreal, Quebec Canada
Soluble Erythropoietin Receptor for Gene Therapy of Breast Cancer
Eliopoulos, Nicoletta; Sep. 2004; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0694
Report No.(s): AD-A434585; No Copyright; Avail: CASI; A02, Hardcopy

Breast cancer is the most common malignancy in women. When the cancer remains localized, long-term survival is possible following surgery to remove the primary tumor. However, when the cancer metastasizes, death occurs for most patients. The progression and metastasis of breast cancer is dependent on angiogenesis. Tumors continuously dispense angiogenic signals. One such signal is erythropoietin (Epo). The general idea of the authors' gene therapy approach is that breast cancer cells can be genetically engineered to release Epo receptor (sEpoR), an antagonist to breast cancer-associated Epo and thus antagonistic to breast cancer-associated angiogenesis. The authors presume that interfering in this manner with tumor-associated blood vessels should bring about a significant anti-tumor effect. Women die of breast cancer despite undergoing surgery, radiotherapy, and chemotherapy. These women for who all else fails may benefit from the novel therapeutic tactic that the authors' propose because the majority of women who succumb to breast cancer have metastatic or unresectable cancer that is refractory to standard treatment. Furthermore, the target of their strategy is tumor-associated neovasculature, which is not of malignant origin. Therefore, it is unlikely that these vascular cells have acquired 'resistance to treatment,' and they should remain responsive to antagonistic stimuli.
DTIC
Angiogenesis; Breast; Cancer; Erythrocytes; Gene Therapy; Genetic Engineering; Hematopoiesis; Hormones; Mammary Glands; Metastasis

20050188809 Naval Health Research Center, San Diego, CA USA
Department of Defense Birth and Infant Health Registry: Annual Report on Birth Defects Among Infants Born to US Military Families, January 1, 1998 Through December 31, 1998
Ryan, Margaret A.; Honner, William K.; Loach, Rosha A.; Alexander, Brianna; Kaufman, Seth A.; Reed, Robert J.; Smith, Tyler C.; Mar. 2005; 26 pp.; In English
Report No.(s): AD-A434587; NHRC-05-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

The US Department of Defense (DoD) is challenged with monitoring and protecting the health and well-being of its service members. The growing number of women on active duty and the diverse hazardous exposures associated with military service make reproductive health issues a special concern. To address this concern, the DoD Birth and Infant Health Registry was established at the DoD Center for Deployment Health Research, located at the Naval Health Research Center in San Diego, California. The DoD Birth and Infant Health Registry captures comprehensive data on healthcare utilization to calculate the prevalence of birth defects among children born to military families. Population-based electronic surveillance is supplemented by active case validation efforts. In 1998, the DoD Birth and Infant Health Registry captured data on the 96,774 livebirths that occurred in US military families worldwide. This report presents detailed data on these infants using nationally standardized definitions for major congenital anomalies diagnosed before 1 year of age. These results complement civilian public health surveillance efforts, and may be especially valuable to military members and their families.
DTIC
Birth; Congenital Anomalies; Defects; Defense Program; Health; Military Personnel

20050188811 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Dendritic Cells Endocytose Bacillus Anthracis Spores: Implications for Anthrax Pathogenesis
Brittingham, Katherine C.; Ruthel, Gordon; Panchal, Rekha G.; Fuller, Claudette L.; Ribot, Wilson J.; Feb. 2005; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434591; RPP-04-369; No Copyright; Avail: Defense Technical Information Center (DTIC)

Phagocytosis of inhaled Bacillus anthracis spores and subsequent trafficking to lymph nodes are decisive events in the progression of inhaled anthrax because they initiate germination and dissemination of spores. Found in high frequency throughout the respiratory tract, DCs routinely take up foreign particles and migrate to the lymph nodes. However, the participation of DCs in phagocytosis and dissemination of spores was not investigated previously. We found that human DCs readily engulfed fully pathogenic and attenuated B. anthracis spores. Spores provoked a loss of tissue-retaining chemokine receptors (CCR2, CCR5) with a concurrent increase in lymph node homing receptors (CCR7, CD11c) on the membrane of DCs. After spore infection, immature DCs displayed a mature phenotype (CD83-bright, HLA-DR-bright, CD80- bright, CD86-bright, CD40 bright), and enhanced co-stimulatory activity. Surprisingly, spores activated the mitogen-activated protein kinase (MAPK) cascade (ERK, p38) and stimulated expression of several inflammatory response genes. MAPK signaling was extinguished by 6 h after infection and resulted in dramatically reduced secretion of TNF-a, IL-6, and IL-8, without inducing DC death. This corresponded temporally with enzymatic cleavage of proximal MAPK signaling proteins (MEK-1, -3, and MKK-4) and may indicate activity of anthrax lethal toxin. Taken together, these results suggest that B. anthracis may exploit DCs to facilitate infection.
DTIC
Bacillus; Crystal Structure; Dendritic Crystals; Infectious Diseases; Pathogenesis

20050188813 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Protective Antigen (PA) and Toxin Neutralization (TNA) Antibody Patterns in Anthrax Vaccinees Undergoing Serial Plasmapheresis
Pitman, Phillip R.; Leitman, Susan F.; Barrera-Oro, Julio G.; Norris, Sarah L.; Marano, Nina M.; Ranadive, Manmohan V.; Sink, Bonnie S.; McKee, Kelly T., Jr; Mar. 2005; 10 pp.; In English
Report No.(s): AD-A434595; RPP-04-459; No Copyright; Avail: Defense Technical Information Center (DTIC)
Recipients of licensed anthrax vaccine (AVA, Biothrax) could serve as a source of hyperimmune plasma and immunoglobulin for therapy and prophylaxis. We examined serum antibody patterns during serial weekly to biweekly plasmapheresis in 38 individuals previously vaccinated with 4-27 doses of AVA. Immunoglobin G (IgG) to protective antigen (PA) and toxin neutralization assay (TNA) antibody levels were highly correlated with r = 0.86930) and P \h 0.0001 for anti-PA concentration versus TNA concentration). Significant decreases in antibody titer and concentration were observed over time when compared for the number of days from the first injection (P = 0.0001 for both anti-PA and TNA concentration) and for the number of days from the first plasmapheresis (P = 0.0007 for anti-PA concentration and P = 0.0025 for TNA concentration). The rate of the decrease in total IgG concentration (half-life T 1/2 = 198.90 days after first plasmapheresis) was significantly less than the decrease in anti-PA IgG (t1/2 = 63.53 days (P = 0.0001), indicating that the reduction in anti-PA IgG was more likely due to natural decay than plasmapheresis. The time since the last injection and the time after initial plasmapheresis are important elements in considering an optimal schedule for collecting anthrax hyperimmune plasma. Good correlation between IgG to PA and TNA antibodies suggests that the anti-PA enzyme-linked immunosorbent assay can be used as a highy-throughput screen for functional immune reactivity in donor plasma units.
DTIC
Antibodies; Antigens; Bacillus; Globulins; Infectious Diseases; Toxins and Antitoxins

20050188815 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
An Update on the Potential of North American Mosquitoes (Diptera: Culicidae) to Transmit West Nile Virus
Turell, Michael J.; Dohm, David J.; Sardelis, Michael R.; O 'Guinn, Monica L.; Andreadis, Theodore G.; Blow, Jamie A.; Sep. 2004; 8 pp.; In English
Report No.(s): AD-A434597; RPP-05-291; No Copyright; Avail: Defense Technical Information Center (DTIC)
Since first discovered in the New York City area in 1999, West Nile virus (WNV) has become established over much of the continental USA and has been responsible for \g10,000 cases of severe disease and 400 human fatalities, as well as thousands of fatal infections in horses. To develop appropriate surveillance and control strategies, the identification of which mosquito species are competent vectors and how various factors influence their ability to transmit this virus must be determined. Therefore, we evaluated numerous mosquito species for their ability to transmit WNV under laboratory conditions. This report contains data for several mosquito species not reported previously, as well as a summary of transmission data compiled from previously reported studies. Mosquitoes were allowed to feed on chickens infected with WNV isolated from a crow that died during the 1999 outbreak in New York City. These mosquitoes were tested approximately 2 wk later to determine infection, dissemination, and transmission rates. All Culex species tested were competent vectors in the laboratory and varied from highly efficient vectors (e.g., Culex tarsalis Coquillett) to moderately efficient ones (e.g., Culex nigripalpus Theobald). Nearly all of the Culex species tested could serve as efficient enzootic or amplifying vectors for WNV.

Several container-breeding Aedes and Ochlerotatus species were highly efficient vectors under laboratory conditions, but because of their feeding preferences, would probably not be involved in the maintenance of WNV in nature. However, they would be potential bridge vectors between the avian-Culex cycle and mammalian hosts. In contrast, most of the surface pool-breeding Aedes and Ochlerotatus species tested were relatively inefficient vectors under laboratory conditions and would probably not play a significant role in transmitting WNV in nature.
DTIC
Insects; Viruses

20050188816 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Genetically Engineered, Live Attenuated Vaccines Protect Nonhuman Primates Against Aerosol Challenge with a Virulent IE Strain of Venezuelan Equine Encephalitis Virus
Reed, Douglas S.; Lind, Cathleen M.; Lackemeyer, Matthew G.; Sullivan, Lawrence J.; Pratt, William D.; Parker, Michael D.; Jan. 2005; 10 pp.; In English
Report No.(s): AD-A434598; RPP-04-350; No Copyright; Avail: Defense Technical Information Center (DTIC)

Two live, attenuated strains of Venezuelan equine encephalitis virus (VEE), IE1150K and V3526, were administered to macaques to determine if they could elicit protection against an aerosol challenge with virulent VEE virus of the IE variety (VEEV-IE). These viruses were rescued from full-length cDNA clones of 68U201 (VEEV-IE variety) and Trinidad donkey (VEEV-IA/B variety), respectively, and both have a furin cleavage site deletion mutation and a second-site resuscitating mutation. Both vaccines elicited neutralizing antibodies to viruses of the homologous variety but not to viruses of the heterologous variety. Eight weeks after vaccination, the macaques were challenged by aerosol exposure to virulent 68U201. Macaques vaccinated with V3526 were protected as well as macaques inoculated with IE1009, the wild-type infectious clone of 68U201. However, IE1150K failed to significantly protect macaques relative to controls. V3526 has now been shown to protect macaques against both IA/B Pratt WD, Davis NL, Johnston RE, Smith JF. Genetically engineered, live attenuated vaccines for Venezuelan equine encephalitis: testing in animal models. Vaccine 2003;21(25-26):3854-62 and IE strains of VEE viruses.
DTIC
Aerosols; Encephalitis; Monkeys; Primates; Vaccines; Viruses

20050188818 Fox Chase Cancer Center, Philadelphia, PA USA
Testing Whether Defective Chromatin Assembly in S-Phase Contributes to Breast Cancer
Adams, Peter; Oct. 2004; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0726
Report No.(s): AD-A434608; No Copyright; Avail: CASI; A02, Hardcopy

Cancer cells characteristically have a high frequency of genome rearrangements. Although these genome rearrangements are likely to contribute to the defective proliferation control that is characteristic of cancer cells, the cause of rearrangements is poorly understood. We used a dominant negative mutant of (chromatin assembly factor-I) CAF1, a complex that assembles newly synthesized DNA into nucleosomes, to inhibit S-phase chromatin assembly and found that this induced S-phase arrest. Arrest was accompanied by DNA damage. These results show, for the first time, that in human cells CAF1 activity is required for completion of S-phase and defects in chromatin assembly induce DNA damage. We propose that errors in chromatin assembly, occurring spontaneously or caused by genetic mutations or environmental agents, contribute to genome instability and cancer. Consistent with this idea, preliminary evidence indicates that chromatin assembly factors are mutated in some human cancers.
DTIC
Breast; Cancer; Chromatin; Defects; Mammary Glands; Proteins

20050188819 Texas Univ., Houston, TX USA
Differential Processing of Cyclin E Variants in Normal vs Tumor Cells and Their Role in Breast Cancer Oncogenesis
McGahren, Mollianne J.; Keyomarsi, Khandan; Aug. 2004; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9214
Report No.(s): AD-A434609; No Copyright; Avail: CASI; A02, Hardcopy

Cyclin E is a positive regulator, which controls the transition of the G1 to S phase of the cell cycle. When associated with CDK2, it is responsible for cells passing through the restriction point, which is the barrier between G1 and S. This commits the cells to complete one round of cell division. Previous findings by this laboratory have found that overexpression of cyclin

E and the presence of lower molecular weigh isoforms (LMW) are found more often in breast tumors and cancer cell lines when compared to normal tissues and cells. Also, tumor cells, but not normal cells have the mechanisms to proteolytically cleave the full length cyclin E into these LMW forms. An altered cyclin E may contribute to the deregulation of the G1 to S checkpoint and lead to tumorigenesis. Our laboratory has also identified through mutational and biochemical analysis, the region of cyclin E that is proteolytically cleaved to generate the LMW forms. Critical phosphorylation sites of cyclin E are responsible for the appearance of the LMW forms of cyclin E. To investigate the possible role of phosphorylation in the processing of cyclin E into these lower forms, two approaches have been employed. First incubation of breast cancer cell line extracts expressing the LMW forms with phosphatases was examined via western blot analysis. Visualization of cyclin E showed downward shifts in both the full length and lower forms in the presence of active dephosphorylation.
DTIC
Breast; Cancer; Cells (Biology); Mammary Glands; Phosphorylation; Tumors

20050188820 California Univ., San Francisco, CA USA
Relating Androgen Receptor Conformation to Function in Prostate Cancer Cells
Webb, Paul; Jan. 2005; 47 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0130
Report No.(s): AD-A434610; No Copyright; Avail: CASI; A03, Hardcopy

Androgen Receptor (AR) recruits SRC coactivators in response to stimulation by hormone and other signals, thereby promoting prostate cancer growth and survival. Activated AR adopts two conformations, a head-to-tail dimer where a coactivator binding site (AF-2) in the C-terminal ligand binding domain (LBD) recognizes a short peptide (FQNLF) in the N-terminal domain of a partner AR and an alternate dimer with AF-2 available for contacts with SRC LxxLL motifs. Here, the authors set out to identify AR mutants committed to particular conformations and to create stable cell lines that express these mutants. As part of an unexpected collaboration, they obtained crystals of AR LBDs in complex with FxxLF and LxxLL peptides and evidence that AR interactions with SRC2 require AF-2 contacts with LxxLL motifs. They learned how to obtain AR mutants unable to form the head-to-tail dimer and created vectors suitable for stable AR expression. They created prostate cancer cells that express a tet-repressor protein and are now selecting cells that express AR under tet control and HeLa cells that express human AR or AR mutants. These cells will be used for studies of effects of AR conformation on coactivator recruitment and prostate cancer cell behavior.
DTIC
Cancer; Chemoreceptors; Hormones; Males; Mutations; Prostate Gland; Tumors

20050188821 Dorn Research Inst., Inc., Columbia, SC USA
Preliminary Investigation of the Role of Cellular Immunity in Estrous Cycle Modulation of Post-Resection Breast Cancer Spread
Hrushesky, William J.; Aug. 2004; 53 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-98-1-8016
Report No.(s): AD-A434612; No Copyright; Avail: Defense Technical Information Center (DTIC)

The timing of resection of a transplantable breast cancer within the mouse's estrous cycle affects whether the cancer metastasizes or whether the operation cures the mouse. Surgery during the pro-estrus phase cured 2 1/2 times more frequently than the opposite timing. The authors have studied the immune capacity of the mouse to generate natural killer (NK) cell activity. Surgical curability was optimal during pro-estrus when immunocompetence was most robust. Enhancing NK function diminishes metastatic spread while interfering with NK function increases spread. Estrogens diminish NK function. The authors plan to determine whether hormone-dependent immunocyte suppression affects fertility cycle modulation of cancer spread; which female sex hormones control post-resection spread; whether estrogen and/or progesterone affect the duration of NK cell activity suppression and numbers of NK, helper T, and/or suppressor T cells following resection; and whether deleting specific immune cell types by 'in vivo' administration of antibodies abrogates the estrous cycle and sex hormone modulation of post-resection cancer spread. Demonstration that NK, T helper, and/or T suppressor cells are essential for sex hormone modulation of cancer spread would implicate neo-adjuvant sex hormone and other cellular immune enhancement strategies before and/or following breast cancer resection to improve cure frequency.
DTIC
Breast; Cancer; Hormones; Mammary Glands; Metastasis; Modulation; Sex; Surgery

20050188823 Naval Health Research Center, San Diego, CA USA
Evaluating Health Effects of Military Service: The Millennium Cohort Study
Gumbs, Gia; Ryan, Margaret A.; Jan. 2003; 5 pp.; In English
Report No.(s): AD-A434618; NAVHLTHRSCHC-03-27; No Copyright; Avail: CASI; A01, Hardcopy

The Millennium Cohort Study is a project recommended by Congress and sponsored by the Department of Defense. The study will survey and follow nearly 140,000 people during and after their military service, for up to 21 years. That makes it the largest study of its kind in military history. The goal of the Millennium Cohort Study is to evaluate the long-term health effects of military service.

DTIC
Health; Medical Services; Military Operations; Military Personnel

20050188824 Mayo Clinic, Rochester, MN USA
PARK2, a Large Common Fragile Site Gene, is Part of a Stress Response Network in Normal Cells that is Disrupted During the Development of Ovarian Cancer
Smith, David I.; Jan. 2005; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0082
Report No.(s): AD-A434619; No Copyright; Avail: Defense Technical Information Center (DTIC)

PARK2 (Parkin) is an extremely large gene that spans greater than 1.3 megabases of genomic sequence within chromosomal band 6q26. This gene is also derived from within the middle of the highly unstable FRA6E common fragile site (CFS). CFSs are large chromosomal regions that are highly unstable and prone to deletions and other alterations, especially in developing cancer cells. The central two questions that we want to address with this work are what role does the inactivation of Parkin play in the development of ovarian cancer and whether this gene functions as part of a stress response network. In order to address these two questions, we have analyzed the effect of reintroducing Parkin into ovarian cancer cell lines that do not express it. We then demonstrate that the re-introduction of Parkin is associated with greater sensitivity to the induction of apoptosis. This is consistent with our hypothesis that inactivation of this gene contributes to ovarian cancer development. In order to study whether Parkin is part of a stress response network, we have begun to characterize other proteins that Parkin interacts with, including another large CFS gene WWOX. WWOX functions as part of a stress response network and is specifically phosphorylated in stressed cells and then it binds to p53, translocates to the mitochondria and induces apoptosis. We demonstrate specific interactions between Parkin and WWOX;, thus Parkin may also be part of a stress response network in normal cells that is disrupted during the development of ovarian cancer.

DTIC
Cancer; Diseases; Genetics; Ovaries

20050188825 Miami Univ., FL USA
Hyaluronic Acid and Hyaluronidase in Prostate Cancer: Evaluation of Their Therapeutic and Prognostic Potential
Lokeshwar, Vinata B.; Jan. 2005; 75 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0095
Report No.(s): AD-A434622; No Copyright; Avail: CASI; A04, Hardcopy

Identification of accurate prognostic indicators could aid in individualization of treatment and better prediction of outcome or prostate cancer patients. Treatment modalities that target these molecules could effectively control CaP progression. The results of this project identify HYAL1 type hyaluronidase (HAase) as one such molecule. HA is a glycosaminoglycan and HAase is an enzyme that degrades HA into angiogenic fragments. Immunohistochemical analysis using archival radical prostatectomy CaP specimens from patients on whom there is 72-131 month follow-up show that HYAL1 and combined HA-HYAL1 inferences staining are independent predictors for biochemical recurrence. Studies on HYAL1 transfectants show that blocking HYAL1 expression in CaP cells, decreases growth and invasive activity by 3-4 fold. Lack of HYAL1 expression blocks CaP cells in G2-M phase of the cell cycle. HYAL1-AS transfectants show a 4-7 fold decrease in tumor growth, and generate tumors that are non-infiltrating and less vascularized. HAase inhibitors such as inhibit CaP cell growth in a dose-dependent manner. Transfectants expressing high HYAL1 levels also grow 4-fold slower and undergo apoptosis. High HYAL1 producing transfectants show either decreased tumor growth (3-fold) or do not form tumors. Ongoing studies are examining the effect of HAase inhibition on gene expression by cDNA microarray analysis.

DTIC
Cancer; Histochemical Analysis; Prostate Gland; Therapy

20050188826 Evanston Northwestern Healthcare Research Inst., Evanston, IL USA
Role of Heregulin in the Neovascularization of Breast Carcinoma Cancer
Menedez, Javier A.; Lupu, Ruth; Aug. 2004; 62 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0305
Report No.(s): AD-A434623; No Copyright; Avail: CASI; A04, Hardcopy

Several oncogenese, growth factors, hormones and hypoxia have been shown to up-regulate VEGF, an essential angiogenia factor for the progression of breast carcinomas. The angiogenic factor CYRG1, a ligand for the alphavbeta3 integrin is differentially up-regulated in invasive and metastatic breast cancer cells overexpressing the epidermal growth factor-like growth factor Heregulin (HRG). HRG can regulate breast cancer neovascularization through its ability to activitie the expression and secretion of VEGF. Although CYR61 is thought to be an angiogenic ligand for alphavbeta3 integrin in endothelial cells, little is know about the regulatory role of CYR61 on the secretion of VEGF in the epithelial compartment of breast carcinoma. We speculated that CYR61 may promote VEGF-dependent breast cancer angiogensis in an autocrine fashion, and we examined whether HRG-induced over-secretion of VEGF in breast cancer cells associated with an increased CYR61-regulated alpha4beta3 integrin signaling. First constitutive VEGF secretion positively correlated with HRG overexpression, but not with HER-2/neu (erbB-2) oncogene status, in a panel of human breast cancer cell lines. Second, we evaluated the levels of VEGF secretion in MDA-231 cells, a natural breast cancer model overexpressing HRG. In which HRG expression was diminished using an HRG antisense (AS) cDNA. Secretion of VEGF was significantly diminished in the unselected MDA-MB-231/AS-POOL population (up to 30% reduction), and decreased by about 55% in MDA-231/AS-31 transfectants, an AS-HRG clone expressing low to undetectable levels of HRG.
DTIC
Angiogenesis; Breast; Cancer; Hormones; Mammary Glands

20050188827 Cold Spring Harbor Lab., New York, NY USA
Synthetic Lethality in Breast Cancer Cells: Genes Required for Tumor Survival
Hannon, Gregory J.; Jul. 2004; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0208
Report No.(s): AD-A434625; No Copyright; Avail: CASI; A02, Hardcopy

The conversion of a normal cell into a cancer cell proceeds through a series of genetic and epigenetic alterations. We have proposed to use well established genetic methodologies to identify novel anti-cancer targets via their specific, genetic interactions with common cancer mutations. In short, we will identify genetic alterations that are neutral in normal cells, but that are lethal when combined with cancer mutations. This 'synthetic lethality' approach may identify potential therapeutic targets that are highly specific to the cancer cell.
DTIC
Breast; Cancer; Genes; Lethality; Mammary Glands; Oncogenes; Survival; Tumors

20050188828 Drexel Univ., Philadelphia, PA USA
International Biodefense Enhancement Capabilities from a Policy Perspective
Onaral, Banu; May 2005; 91 pp.; In English
Contract(s)/Grant(s): W81XWH-04-C-0006
Report No.(s): AD-A434626; No Copyright; Avail: CASI; A05, Hardcopy

Civilian populations across the world have a great deal to accomplish in the effort to enhance preparedness against potential mass casualty incidents. Strategies for Incident Preparedness: A National Model and the online Hospital Self-Assessment Tool (developed by CIMERC) will be made available in the Spanish language to address this global need. The need to provide strategic assessment and preparedness enhancement tools in diverse language sets was further underscored at the 2003 American Telemedicine Association meeting in Orlando, Florida. Major General Martinez-Lopez, during his speech at the International Day meeting, requested and encouraged international partnerships and ventures in the spirit of advancement. A partnership between CIMERC and eSalud Americas (formerly ERA Digital) to provide the Hospital Self-Assessment Tool and the Strategies for Incident Preparedness: A National Model for an international community represents one such opportunity. The proposed translation and adaptation effort and the implementation networking effort by eSalud Americas and CIMERC complements present efforts within Argentina. This collaboration and interaction with the Pan-American Health Organization will provide a major dissemination window starting with Argentina to the rest of Latin American cultures. Provision of the identified strategic tool will have an immediate impact on domestic and international preparedness for mass casualty incidents. CIMERC, presently a national biodefense repository, will begin to develop an

international component that will invariably serve to complement both domestic and international emergency response practices.
DTIC
Augmentation; Early Warning Systems; Management Systems; Medical Services; Policies

20050188830 Agency for Healthcare Research and Quality, Rockville, MD USA
Safe Practices for Better Health Care
Kizer, Kenneth W.; Blum, Laura N.; Jan. 2005; 11 pp.; In English
Report No.(s): AD-A434657; No Copyright; Avail: Defense Technical Information Center (DTIC)

Modern health care is highly complex, high risk, and error prone. Not surprisingly, health care errors and consequent adverse events are a leading cause of death and injury, even though well-documented methods to prevent the occurrence of many of these errors are available. The recent heightened attention that has been focused on medical errors has sparked interest in the use of health care practices that reduce the risk of harm resulting from the processes, systems, or environments of- care, i.e., Safe Practices. At the request of and with funding from- the Agency for Healthcare Research and Quality and the Centers for Medicare and Medicaid Services, the National Quality Forum (NQF) identified more than 220 candidate Safe Practices. Through its formal consensus development process, the NQF endorsed 30 evidence-based Safe Practices that should be universally employed in applicable clinical care settings to reduce the risk of errors and harm to patients. In addition, the NQF identified 27 promising practices that should be high priority for further research. This report identifies the 30 NQF-endorsed Safe Practices and describes some key aspects of the process used by the NQF in endorsing these first-ever national voluntary consensus standards for patient safety practices.
DTIC
Clinical Medicine; Health; Management Systems; Medical Services; Procedures; Safety

20050188832 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Characterization of Beta-leptinotarsin-h and the Effects of Calcium Flux Antagonists on its Activity
Crosland, Richard D.; Fitch, Richard W.; Hines, Harry B.; Apr. 2005; 15 pp.; In English
Report No.(s): AD-A434670; No Copyright; Avail: Defense Technical Information Center (DTIC)

Beta-Leptinotarsin-h, purifed from the hemolymph of the beetle Leptinotarsa haldemani, is a potent neuroactive protein that stimulates Ca2+ influx and neurotransmitter release. Our goals were to further characterize beta-leptinotarsin-h and to test the hypthesis that it stimulates Ca2+ influx through presynaptic Ca2+ channels. Analysis of partial amino acid sequences revealed that beta-leptinotarsin-h is a unique protein with significant similarity to only one other protein, the juvenile hormone esterase of Leptinotarsa decemlineata, commonly known as the Colorado potato beetle. We examined the effect of beta-leptinotarsin-h on neurotransmitter release, Ca2+ current, Ca2+ uptake, and Ca2+ levels in several cell lines and neuronal systems. We found that its preferred site of action appears to be mammalian presynaptic nerve terminals. We tested antagonists of Ca2+ flux for their effects on beta-leptinotarsin-h-stimulated Ca2+ uptake in rat brain synaptosomes. We found that the nonselective Ca2+ channel blockers flunarizine, Ni2+, ruthenium red, high-concentration thapsigargin, and SKF 96365 inhibited beta-leptinotarsin-h's activity, but that non of the selective blockers of voltage-operated Ca2+ channels (w-agatoxin, IVA, w-conotoxin GVIA, w-conotoxin MVIIC, nicardipine, SNX 482) that we tested was inhibitory. Selective inhibitors of ligand-operated, store-operated, and transduction-operated channels were also not inhibitory. beta-leptinotarsin-h did not stimulate Na+ uptake, ruling out Na+ channels and nonselective cation channels as targets. We conclude that beta-leptinotarsin-h stimulated Ca2+ channels, which channel is yet to be determined.
DTIC
Calcium; Pharmacology

20050188835 Agency for Healthcare Research and Quality, Rockville, MD USA
Development and Validation of the Medication Administration Error Reporting Survey
Wakefield, Bonnie J.; Uden-Holman, Tanya; Wakefield, Douglas S.; Jan. 2005; 16 pp.; In English
Report No.(s): AD-A434734; No Copyright; Avail: Defense Technical Information Center (DTIC)

Analysis of medication errors can lead to system improvement and reduced risk only if the errors are detected, reported, and used to design better patient-care practices and systems. Voluntary medication error reporting systems rely on the ability and willingness of individual physicians, pharmacists, and nurses to detect and report errors as part of their routine practice. Because of the central role nurses play in medication administration, it is important to understand their perceptions of the medication error reporting process. This paper describes the development and validation of a survey designed to measure nurse

perceptions of medication administration error (MAE) reporting. The survey contains questions in three general content areas: why medication errors occur; reasons why medication errors are not reported; and the estimated percentage of medication errors actually reported. Over the past 10 years, the MAE survey has been administered four times to nurses in Iowa's acute care hospitals statewide. Principal components exploratory-factor analysis with orthogonal rotation was used to determine if the individual items could be combined into subscales. Five subscales emerged for 'reasons why MAE occur"; four subscales emerged for 'reasons why MAE are not reported.' Subscale reliability was assessed using Cronbach's Coefficient Alpha. Although health care organizations have implemented continuous quality improvement programs that focus on systems, rather than individuals, barriers remain in MAE reporting. Surveys, such as the one described here, provide a basis to begin discussions about improving the system.
DTIC
Error Detection Codes; Errors; Management Systems; Medical Services; Surveys

20050188836 Agency for Healthcare Research and Quality, Rockville, MD USA
Developing a Taxonomy of Anesthetists Nontechnical Skills (ANTS)
Patey, Rona; Flin, Rhona; Fletcher, Georgina; Maran, Nicola; Glavin, Ronnie; Jan. 2005; 13 pp.; In English
Report No.(s): AD-A434742; No Copyright; Avail: Defense Technical Information Center (DTIC)

Safety research in high-reliability industries, such as aviation, has clearly shown that the causes of accidents are primarily related to deficiencies in nontechnical (cognitive and social) skills, rather than a lack of technical expertise. Investigations into causes of error in anesthesia have revealed a similar pattern. The aviation industry uses behavioral marker systems to structure the training and assessment of pilot crew resource management (CRM) (nontechnical) skills. These are empirically derived taxonomies of the principal required nontechnical skills, and an observation-based rating system for assessing their component behaviors. In medicine, the enthusiasm for adopting CRM-type training needs to be underpinned by the development of a properly tested nontechnical skills framework for a given specialization. A research project involving industrial psychologists and consultant anesthetists, and funded by the National Health Service Education for Scotland, is developing and evaluating a behavioral marker system for anesthetists. It has produced and experimentally evaluated a taxonomy of anesthetists nontechnical skills (ANTS), which can be used to guide professional syllabi, offer a method for evaluating performance, and improve the quality of feedback to trainees. This paper will provide an overview of the ANTS System and the results of usability trials conducted in the operating theatre.
DTIC
Anesthesia; Insects; Taxonomy

20050188838 American Coll. of Physicians, Philadelphia, PA USA
An Ambulatory Care Curriculum for Advancing Patient Safety
Mottur-Pilson, Christel; Jan. 2005; 12 pp.; In English
Report No.(s): AD-A434757; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this project was to develop and implement a seven module ambulatory care continuing medical education (CME) curriculum and to evaluate the effectiveness of this curriculum in facilitating patient safety. For knowledge transfer and adoption, each module focused on one safety concept, followed by clinical cases and take-home points. The dissemination strategy relied on the 'train the trainer' model and utilized the governance structure of the American College of Physicians (ACP).
DTIC
Clinical Medicine; Education; Medical Services; Patients; Safety

20050188840 Agency for Healthcare Research and Quality, Rockville, MD USA
Quality Indicators Sensitive to Nurse Staffing in Acute Care Settings
Savitz, Lucy A.; Jones, Cheryl B.; Bernard, Shulamit; Jan. 2005; 12 pp.; In English
Report No.(s): AD-A434760; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this era of patient safety, quality indicators associated with the nursing profession have evolved from nursing-sensitive to adverse event sensitive. This paper aims to compare and contrast available quality indicator ools associated with nurse staffing outcomes. Methods: We conducted a systematic review of literature from the past 6 years, identifying research and/or monitoring efforts reporting structure, process, and/or outcomes measures associated with nursing care. Twenty-four articles were selected, and identified indicators from the National Quality Forum were compared/contrasted with relevant AHRQ Patient Safety Indicators. Results: The results of this study provide an important comparative assessment of the types, content,

and intended purpose of available nursing indicators. We found little overlap and direction in the types of indicators available to examine the influence of nurse staffing on the outcomes of care. Further, there are no process measures available. The need for consistent indicator definitions and process measures is addressed.
DTIC
Medical Personnel; Patients; Safety; Sensitivity

20050188841 Agency for Healthcare Research and Quality, Rockville, MD USA
Serious Reportable Adverse Events in Health Care
Kizer, Kenneth W.; Stegun, Melissa B.; Jan. 2005; 15 pp.; In English
Report No.(s): AD-A434763; No Copyright; Avail: Defense Technical Information Center (DTIC)

Health care errors resulting in patient harm are a leading cause of morbidity and mortality in the USA, although there is no national reporting of such occurrences. A number of States require reporting of at least some types of these adverse events; however, it is widely agreed that, even where there is required reporting, such events are grossly underreported, due in part to ambiguity about what is to be reported. In 1999, the Institute of Medicine (IOM) recommended that health care errors and adverse events be reported in a systematic manner. The Federal Government s Quality Interagency Coordination Committee concurred with the IOM s recommendation for greater health care error and adverse event reporting, and the National Quality Forum (NQF) was asked to identify a standardized list of preventable, serious adverse events that would facilitate reporting of such occurrences. This article presents the NQF-endorsed consensus list of 27 serious reportable events in health care, along with a discussion of the criteria used in selecting the list and various issues related to implementing reporting of these events. Since the NQF promulgated this list of serious reportable events in 2002, several States and other entities have enacted legislation or taken administrative action to require reporting of these 'never events.'
DTIC
Errors; Health; Medical Services

20050188842 Agency for Healthcare Research and Quality, Rockville, MD USA
Standardizing Medication Error Event Reporting in the U.S. Department of Defense
Nosek, Ronald A., Jr.; McMeekin, Judy; Rake, Geoffrey W.; Jan. 2005; 15 pp.; In English
Report No.(s): AD-A434765; No Copyright; Avail: Defense Technical Information Center (DTIC)

Soon after the 1999 Institute of Medicine report, To Err Is Human, was released, the Department of Defense (DoD) began an aggressive examination of medical errors and the strategies for minimizing them. A primary goal was the creation of a standardized medication event reporting system, including a central registry for the compilation of reported data. This paper describes important experiences gleaned from the DoD's transition to a standardized medication error reporting system. MEDMARXSM, an Internet-based commercial reporting application, was selected by the DoD leadership as the standard tool for medication event reporting. MEDMARX was implemented initially at five military hospitals in fall 2000 as part of a patient safety pilot project, and was later made available to all 143 military treatment facilities worldwide. Medication errors represent approximately 50 percent of all patient safety events reported by military health care facilities. Although the challenges associated with the implementation of a standardized error reporting system were considerable in number and scope, the long-term benefits to the DoD are significant.
DTIC
Defense Program; Errors; Medical Services; Military Operations; Patients; Safety; Standardization

20050188843 Agency for Healthcare Research and Quality, Rockville, MD USA
The Incident Decision Tree: Guidelines for Action Following Patient Safety Incidents
Meadows, Sandra; Baker, Karen; Butler, Jeremy; Jan. 2005; 14 pp.; In English
Report No.(s): AD-A434767; No Copyright; Avail: Defense Technical Information Center (DTIC)

The National Patient Safety Agency has developed the Incident Decision Tree to help National Health Service (NHS) managers in the UK determine a fair and consistent course of action toward staff involved in patient safety incidents. Research shows that systems failures are the root cause of the majority of safety incidents. Despite this, when an adverse incident occurs, the most common response is to suspend the clinician(s) involved, pending investigation, in the belief that this serves the interests of patient safety. The Incident Decision Tree supports the aim of creating an open culture, where employees feel able to report patient safety incidents without undue fear of the consequences. The tool comprises an algorithm with accompanying guidelines and poses a series of structured questions to help managers decide whether suspension is essential or whether alternatives might be feasible. The approach does not seek to diminish health care professionals individual accountability, but

encourages key decisionmakers to consider systems and organizational issues in the management of error. Initial findings show the Incident Decision Tree to be robust and adaptable for use in a range of health care environments and across all professional groups. It is hoped that applying the tool throughout the NHS will encourage open reporting of actual and prevented patient safety incidents and promote a uniformly fair and consistent approach toward the staff involved.
DTIC
Decision Making; Patients; Safety

20050188844 Agency for Healthcare Research and Quality, Rockville, MD USA
Technology for Improving Medication Monitoring in Nursing Homes
Lapane, Kate L.; Cameron, Kathleen; Feinberg, Janice; Jan. 2005; 14 pp.; In English
Report No.(s): AD-A434774; No Copyright; Avail: Defense Technical Information Center (DTIC)

A 1997 report entitled Prescription Drug Use in Nursing Homes, by the Department of Health and Human Services Office of the Inspector General, states that patients may be experiencing unnecessary adverse medication reactions as a result of inadequate monitoring of medications. Of the preventable adverse drug events in nursing homes, 70 percent occurred at the monitoring stage of the medication use process. While clinical informatics systems have focused on the reduction of medication errors at the point of prescribing, dispensing, or administration, few have proposed the use of information technology in the monitoring stage of the medication use process. The authors describe a unique clinical tool for pharmacists and other health professionals the Geriatric Risk Assessment MedGuideTM (GRAMTM) to reduce serious, preventable adverse drug events occurring during the monitoring stage of the medication use process. The authors focus on the prevention of delirium and falls, as these are two of the most common preventable adverse drug events in nursing homes. With the goal of preventing avoidable medication-related problems, GRAM identifies medications that may cause, aggravate, or contribute to common geriatric problems and facilitates the incorporation of medication-monitoring information in the care plan. Furthermore, the authors describe the real-time integration of the GRAM software with commercial pharmacy software, the development of reports for use in the nursing homes, the development and delivery of GRAM training for nursing facility staff, and early reports of acceptance of the software.
DTIC
Clinical Medicine; Medical Services

20050188846 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Risk of Peripheral Nerve Disease in Military Working Dogs Deployed in Operations Desert Shield/Storm
Vest, Kelly G.; Jan. 2003; 137 pp.; In English
Report No.(s): AD-A434789; No Copyright; Avail: Defense Technical Information Center (DTIC)

A population-based, cohort study was conducted to determine the importance of Gulf War deployment to Southwest Asia, from 1 August 1990 to 31 December 1991, in explaining neurologic mortality and peripheral nerve disease among USA military working dogs. The study cohort consisted of 2,123 military working dogs that were eligible to deploy to the Gulf War and died between 4 September 1990 and 30 June 2001 with complete medical records maintained at the Department of Defense Military Working Dog Training Center and Veterinary Services, Lackland AFB, San Antonio, TX. Within this Gulf War cohort was a prospectively followed cohort of 651 dogs; 347 of these dogs had complete peripheral nerve histopathologic diagnostic records. Descriptive analysis of the study variables defined neurologic mortality incidence for the Gulf War cohort at 1.90 cases per 1,000 dog-months. Rates among dogs assigned to the USA, overseas, and Southwest Asia were 1.83, 1.91, and 2.44 cases per 1,000 dog-months, respectively. Analysis of other exposures showed highest neurologic mortality among dogs assigned to Southwest Asia countries other than Saudi Arabia, dogs arriving before or departing after the war, dogs that arrived before and departed after the war, and dogs that spent more than 176 days in Southwest Asia. Peripheral nerve disease incidence was 3.69 cases per 1,000 dog-months for the prospective cohort. The rate for dogs assigned to the USA was higher than for those overseas or in Southwest Asia (3.86, 3.53, and 3.21 cases per 1,000 dog-months, respectively). Using survival analysis, adjusted neurologic mortality and peripheral nerve disease rates were similar between the USA, overseas, and Southwest Asia assignment locations. An increasing trend of neurologic mortality was evident with increased time spent in Southwest Asia.
DTIC
Deployment; Deserts; Diseases; Dogs; Nerves; Nervous System; Risk; Storms; Veterinary Medicine

20050188847 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA

The Military Deployment Human Exposure Assessment Study (MDHEXAS): Blood and Urine Exposure Biomarkers as Environmental Surveillance Tools for Assessing Military Personnel Exposure to Chemicals During Deployment to Camp McGovern, Bosnia

Jan. 2003; 194 pp.; In English

Report No.(s): AD-A434794; No Copyright; Avail: Defense Technical Information Center (DTIC)

Currently the Department of Defense (DoD) does not use exposure biomarkers to measure environmental exposures to chemicals. Blood and urine exposure biomarkers for volatile organic compounds (VOC), selected heavy metals, depleted uranium (DU), and chemical warfare agents are currently available but have not been field tested or validated in military deployments as a tool to document exposures by the DoD. The Military Deployment Human Exposure Assessment Study, a prospective cohort of 46 soldiers deployed to Bosnia, was designed to validate blood and urine exposure biomarkers as a mechanism to document exposures to these chemicals during military deployments. Blood and urine were collected pre-, during, and post deployment. Standard questionnaire was administered, and environmental and occupational monitoring methods were conducted for comparison to the exposure biomarker results. The urine depleted uranium, blood VOC, urine heavy metals, and blood heavy metals results are compared pre-, during, and post deployment and against standard US reference ranges for the same compounds. The results of the study indicate that natural uranium and styrene environmental exposures increased during deployment. Therefore, exposure biomarkers may be a valuable tool in assessing exposures and risk from environmental and occupational chemicals and hence imperative to include in a comprehensive DoD preventive medicine program.

DTIC

Biomarkers; Blood; Bosnia and Herzegovina; Chemical Warfare; Deployment; Exposure; Military Personnel; Surveillance; Urine

20050188848 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA

Comparison of Experimental Models for Predicting Laser Tissue Interaction from 3.8-Micron Lasers

Williams, C. M.; Jul. 2004; 45 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434796; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this study was to compare and contrast the effects of single 3.8-micron laser pulses in an in-vitro and in-vivo model of human skin and to demonstrate the efficacy of in-vitro laser tissue interaction models. The minimum exposure required to produce specific, gross morphologic changes from a four microsecond, pulsed skin exposure for both models was determined. Histologic samples of the tissues were compared to ascertain the effectiveness of the in-vitro models. Eighteen artificial skin equivalents, (in-vitro model), were exposed and compared to exposures made on five Yorkshire pigs. Representative biopsies were taken for histologic evaluation from various locations immediately, one hour, and 24 hours following exposure. The pattern of epithelial changes seen following in-vivo exposure of pig skin was similar to the changes previously observed in human skin equivalents, indicating that the artificial skin equivalents are representative in-vitro models for this particular combination of laser parameters.

DTIC

Electromagnetic Interactions; Lasers; Mathematical Models; Pulsed Lasers

20050188849 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA

Novel Insights into p63 Expression and Function in Prostate

Davis, Leland; Jan. 2004; 127 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434801; No Copyright; Avail: Defense Technical Information Center (DTIC)

The central hypothesis of this dissertation is that p53 homologues exist and that identification of these genes will provide a better understanding of the role p53 gene family plays in biology and cancer. At the beginning of this research, no p53 related gene was known. Subsequently, p63, a p53 homolog was described by other investigators. p63 is necessary in the development of epithelial structures. One of the isoforms of p63, DNp63, is highly expressed in prostates, which led to the hypothesis that DNp63 has critical functions in the prostate. The studies reported here provide new insights into the expression and function of p63 in the prostate and prostate cancer. Initially, p53 homologs were sought in human prostate epithelial derived cell cultures through degenerate RT-PCR and other techniques. When the discovery of p63 using a similar approach was reported, our effort focused on p63 evaluation in tissue microarrays of benign and malignant prostate tissues. The basal cell specific expression of DNp63 in normal prostate is very striking. DNp63 is absent in other cell types in normal prostate and is not expressed in prostate adenocarcinoma. Detectable p63 was found in immortalized and early passage cell cultures derived from benign and malignant prostate tissue, but not in senescent cultures. Experimental models using adenovirus p63 expression

vectors and prostate cell culture models have been developed. Evaluation of i proteins involved in cell growth and development regulation suggested that p63 overexpression reduced serine 9 phosphorylation of GSK3β and AKT. The selective presence of DNp63 in basal cells of the prostate revealed it to be an excellent new bio-marker of prostate basal cells and epithelial cell cultures. DNp63 has already found translational utility in the diagnostic pathology setting for excluding prostate cancer in biopsies dues to its basal cell restricted expression in only benign glands.
DTIC
Cancer; Genes; Prostate Gland; Proteins

20050193460 Guastaferro (Angelo), USA
A Lengthy Career's Lessons on Risk
Guastaferro, Angelo; ASK Magazine; No. 21; Spring 2005, pp. 24-27; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

I BECAME A PROJECT MANAGER AT AGE TWENTY-TWO AT Eglin Air Force Base. I managed the droning of the B47 to fly unmanned, and 1 had zero experience to take on that task. What 1 learned is the real way you acquire risk aversion: 1 was scared to death that I d fail. This developed a characteristic that 1 carried with me throughout my career. The strongest thing a project leader can feel, in terms of risk, is the risk of failing. So I took it upon myself to learn everything about the airplane and the guidance control system by searching out the best in the aerospace community. At that time, Lockheed was doing a modification of the aircraft. Boeing designed and built the aircraft, and Sperry was doing the guidance control system. I made sure that I spent hours and hours with each of them to understand exactly what 1 was responsible for.
Derived from text
Aerospace Industry; Failure; Risk; Occupation

20050195892 Naval Health Research Center, San Diego, CA USA
Evaluation of Telemedicine Satisfaction Among Naval Radiologists
Bohannan, Britt; Strychacz, Chris; Melcer, Ted; Jan. 2003; 24 pp.; In English
Report No.(s): AD-A434504; NHRC-03-1A; No Copyright; Avail: Defense Technical Information Center (DTIC)

The focus of this study was to assess levels of satisfaction and experience among radiologists using teleradiology and other telemedicine technologies at the Naval Medical Center, San Diego (NMCSD). This study was conducted using a survey administered to resident radiologists, radiologists, and radiology specialists. The survey information was used to compare and contrast the attitudes of users and measure their recent use of telemedicine. This study included assessment and comparison of radiology-specific technologies not addressed in previous studies, such as wireless radiography and computed radiography (CR). A secondary focus of this study was to assess the generalizability of the satisfaction survey instrument used across other telemedicine disciplines. A 60-item survey assessing satisfaction with telemedicine technologies was administered to 20 radiologists at NMCSD. Data from a previous ear/nose/throat (ENT) specialist is included as a comparison with data collected in the present study. Questions assessing general perceptions of telemedicine were the same for both studies. The differences between the two surveys were primarily in details of technologies listed as being specific to each specialty. Items measuring satisfaction, perception, and usefulness, as well as history of use and demographic data were presented. A final open-ended question was included to capture other possible answers not included in the scales. Respondents, ENT and radiology personnel alike, were generally satisfied with the telemedicine technology and process and had very similar positive attitudes about telemedicine in general. The ENT medical personnel responded positively to specific telemedicine technologies specific to their practice, (e.g., Referral Management System and video teleconferencing), and the radiology personnel responded positively to specific radiological technologies (e.g., wireless and CR).
DTIC
Medical Services; Surveys; Telemedicine

20050195894 Moffitt (H. Lee) Cancer Research Inst., Tampa, FL USA
Time-Series Analysis of Human Interpretation Data in Mammography
Beam, Craig A.; Conant, Emily F.; Kundel, Harold L.; Lee, Ji-Hyun; Romily, Patricia A.; Sickles, Edward A.; Jan. 2005; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0606
Report No.(s): AD-A434583; No Copyright; Avail: CASI; A03, Hardcopy

Recent research has documented that the human observer is a significant source of interpretation errors in mammography in the U.S. However, it has yet to be determined whether or not the rate or likelihood of radiologist-specific error changes

across the length of time the radiologist has been reading during a single session, or across the cumulative time the radiologist reads in a year. The purpose of this study was to apply basic methods from the statistical analysis of time series in order to gain novel insights into the characteristics of the human interpretation of mammograms.
DTIC
Breast; Cancer; Mammary Glands; Time Series Analysis

20050195895 Notre Dame Univ., IN USA
Molecular Mechanisms of Metastatic Progression in Breast Cancer
Flanagan, Louise A.; Jul. 2004; 19 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0527
Report No.(s): AD-A434588; No Copyright; Avail: CASI; A03, Hardcopy

Clusterin is a multifunctional glycoproptein involved in tissue remodeling and apoptosis. However, recent studies have demonstrated that clusterin expression correlates with tumor grade in prostate cancer and in one retrospective study has been associated with tumor progression in breast cancer. Furthermore clusterin expression has been correlated with resistance to cytotoxic compounds such as TNF-alpha in prostate cancer, suggesting that clusterin may play a role in surviving cells. In our studies, we have focused on determining whether clusterin plays a causative role in the progression of human breast cancer by promoting cell survival, increasing cell motility and resistance to cytotoxic drugs. Our studies have utilized an ER-alpha positive non-invasive MCF-7 cell line, an MCF-7 cell line genetically engineered to overexpress clusterin(MCF-7CLU) and an ER-alpha negative breast negative invasive SUM-159PT cell line. Our major finding to date are that MCF-7CLU cells express 5-10 fold higher levels of intra- and extra-cellular clusterin as compared to parental MCF-7 cells. The MCF-7CLU cell line exhibits increased growth rates, altered cellular morphology, a dramatic increase (10-fold) in invasive potential and a delayed apoptotic response to cytotoxic compounds such as TNF-alpha and Tamoxifen in comparison to the parental MCF-7 cells.
DTIC
Breast; Cancer; Mammary Glands; Metastasis; Molecular Properties

20050195898 Georgia Tech Research Inst., Atlanta, GA USA
Complex-Shaped Microcomponents by the Reactive Conversion of Biology Templates
Sandhage, Kenneth H.; Naik, Rajesh; Dec. 2003; 16 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0022
Report No.(s): AD-A434603; AFRL-SR-AR-TR-05-0239; No Copyright; Avail: CASI; A03, Hardcopy

This project has been aimed at: 1)developing a better understanding of the manner in which the morphology and nanostructure of biologically-derived silica microtemplates evolve during the course of reactive conversion, and 2) determining which reaction parameters have the greatest impact on changes in morphology during such reactive conversion. The most significant accomplishments have been: Demonstration (via high resolution TEM analyses) that the reaction of SiO2 diatom frustules with Mg(g) at 650 degrees C results in direct conversion into nanocrystalline MgO and Si(\h15nm) without the formation of intermediate silicate phases. Syntheses of mgO-converted frustules with minimal secondary phases (Si or Mg2Si) by development of an optimized thermal treatment and selective dissolution treatment. Identification and control of critical processing parameters to avoid active vaporization and gas-phase-assisted coarsening during the metathetic conversion of SiO2 frustules into TIO2 Successful syntheses of ZrO2 frustule replicas via a new two-step reaction process (conversion of SiO2 into Mg(g) reaction; then conversion of MgO into ZrO2 via ZrCl4(g) methathetic reaction and selective MgCl2 dissolution in water) .
DTIC
High Resolution; Magnesium Oxides; Morphology; Reactivity; Silicates; Templates

20050195899 North Carolina Univ., Chapel Hill, NC USA
Comparison of Image Quality Among Variations in Specimen Tissue Compression and Fluid Immersion for Diffraction Enhanced Imaging
Parham, Christopher A.; Jan. 2005; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0523
Report No.(s): AD-A434604; No Copyright; Avail: CASI; A03, Hardcopy

The current standard for breast cancer screening and diagnosis is screen-film mammography, which utilizes the principle of x-ray absorption to derive image contrast. A new imaging modality called Diffraction Enhanced Imaging (DEI) builds upon

conventional x-ray imaging by adding two additional contrast mechanisms of refraction and scatter. Applications of this technique to breast imaging are promising, demonstrating significant improvements in visualization when compared digital mammography. One of the primary reasons for compressing the breast is to reduce the deleterious effects of x-ray scatter, reducing the total path through which the photon travels. This study seeks to investigate the effects of compression on breast tissue visualization using DEI. Results from this study will be applied to the development of a clinically based DEI system. Four tissues were imaged at different levels of compression using conventional mammography and DEI. A reader study will be used to determine the effect of compression on visualization.
DTIC
Breast; Cancer; Diffraction; Image Resolution; Imaging Techniques; Mammary Glands; Readers; Refraction; Scattering; Submerging; X Ray Absorption

20050195903 Cornell Univ., Ithaca, NY USA
Nanobiohybrids: New Model Systems for Membranes and Sensors
Giannelis, Emmanuel P.; Jun. 2005; 17 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0512
Report No.(s): AD-A434611; AFRL-SR-AR-TR-05-0237; No Copyright; Avail: CASI; A03, Hardcopy

The focus of this program is to correlate structure and function in biological membranes using nanohybrids as artificial models and to develop new sensors based on nanohybrids. Nanohybrids artificial membranes exhibit characteristics similar to biological membranes and they can be used as sensors. The nanohybrids membranes are synthesized by intercalating amphiphile molecules into the galleries of a layered host producing an alternating amphiphile/ inorganic multilayer. We have established how the nanohybrid membranes respond to changes in temperature, pH, pressure and electric field. For example, permeation through the nanohybrids can be modulated by changing the pH or by switching on and off the electric field across the membrane. We have also shown that the nanohybrid membranes can be used as sensors for different analytes including saccharine and quinine. Different responses have been observed even for molecules that have similar features for example, saccharin and its sodium salt suggesting that the nanohybrid might be useful in developing an electronic nose. The dynamic range of the current sensor for saccharin is 6 micro M to 500 micro M. Recent work has enabled us to optimize the response time (from several minutes to seconds) as well as better understand the sensing mechanism. We have found that the absorption of saccharin renders the membrane more hydrophilic. The more hydrophilic membrane allows for increased absorption of water molecules on both the surfaces and galleries of the membrane, which leads to changes in electrostatic field and polarization of the membrane.
DTIC
Biomimetics; Detectors; Membranes

20050195905 North Carolina Univ., Chapel Hill, NC USA
Rational Design of Rho Protein Inhibitors
Rojas, Rafael J.; Sep. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0646
Report No.(s): AD-A434614; No Copyright; Avail: CASI; A02, Hardcopy

Rho GTPases are molecular switches that fluctuate between on and off states. When active, these proteins function to remodel the actin cytoskeleton by interacting with a number of downstream effector molecules. Recent studies have linked the activation of Rho GTPases with the acquisition of a metastatic phenotype in many types of cancers, including inflammatory breast cancer (IBC). This proposal incorporates a rational approach to target these signaling proteins using small molecule inhibitors that would interfere with their ability to become activated by Rhofamily guanine nucleotide exchange factors (RhoGEFs). The author's strategy incorporates both virtual, structure-based screening and a complementary high throughput drug screen to identify small molecule inhibitors that interfere with Rho GTPase activation and signal transduction. Any inhibitors identified through this research can serve as useful tools for studying Rho-mediated signal transduction cascades and may lead to the development of novel cancer therapeutics.
DTIC
Breast; Cancer; Inhibitors; Mammary Glands; Metastasis; Molecules; Proteins; Target Acquisition

20050195906 California Univ., San Francisco, CA USA
Outcomes of Screening Mammography in Elderly Women
Smith-Bindman, Rebecca; Oct. 2004; 44 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9112
Report No.(s): AD-A434615; No Copyright; Avail: CASI; A03, Hardcopy

There is uncertainty about whether women older than age 65 should undergo screening mammography. Although screening mammography may benefit some elderly women through the detection of early breast cancers, it may harm other women through false positive diagnoses and the detection of clinically insignificant lesions. This research study involves the design and implementation of a data analysis of HCFA Medicare billing claims linked with national tumor registry data from the Surveillance Epidemiology and End Results (SEER) program. The specific aims of this research will evaluate the following: (1) differences in breast cancer mortality, (2) differences in breast cancer treatment, and (3) differences in breast cancer tumor attributes between women who were screened and those who were not. The project involves defining whether Medicare billing claims data are accurate for the assessment of mammography utilization and completion of the outlined aims once these data were shown to be reliable.
DTIC
Age Factor; Cancer; Females; Mortality; Quantitative Analysis; Therapy

20050195907 Institute of Critical Care Medicine, Palm Springs, CA USA
Quantitative Mechanistic Modeling of Sublingual PC02 as an Index of Shock Severity and Resuscitation Success
Weil, Max H.; Sep. 2004; 19 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0696
Report No.(s): AD-A434616; No Copyright; Avail: CASI; A03, Hardcopy

The goal of our study for the first year was to investigate whether the changes in sublingual PCO2 reflect changes in tissue blood flow during hemorrhage and hemorrhagic shock. Hemorrhagic shock was induced by a modification of Wigger's method in male domestic pigs weighting 35 to 40 kg. Sublingual PCO2 increased from 60 to 129 mmHg in parallel with average decreases in cardiac output to 44% and mean arterial pressure to 47%, decreases in EtCO2 from 35 to 28 mmHg together with increases in arterial blood lactate concentrations from 0.7 to 7.8 mmol/l over the two-hour interval of shock. Utilizing colored microspheres for measurements, sublingual blood flow decreased to 34%, liver flow to 56%, and renal flow to 47%. After reinfusion of shed blood, sublingual PCO2 was restored to approximately baseline values together with arterial pressure, cardiac output and EtCO2, but there was delayed reversal of lactic acidosis. Increases in sublingual PCO2, is accomplished by proportionate decreases in sublingual and vital organ blood flows. Our study supports the rationale for non-invasive measurements of sublingual PCO2 for diagnosis and quantitation of the severity of hemorrhagic shock. The goal of our task for the second year was to investigate the possibility that buccal PCO2 provided an additional option as a site of measurement that would facilitate longer term non-invasive monitoring of tissue perfusion. Two groups of pentobarbital anesthetized Sprague-Dawley male rats were bled 40 percent of their estimated blood volume over an interval of 30 minutes. The animals were randomly assigned to measurement of either sublingual or buccal PCO2 with an optical PCO2 sensor. A linear regression analysis between P(BU)CO2 and P(SL)CO2 yielded r=0.94. Buccal PCO2 measurement provides values correlated highly with those of sublingual measurement for the diagnosis and evaluation of the severity of circulatory failure and facilitates continuous recording.
DTIC
Hemorrhages; Mathematical Models; Resuscitation; Shock (Physiology)

20050195908 Vanderbilt Univ. Medical Center, Atlanta, GA USA
In Vivo p53 Signaling in Breast Epithelial Cells After Oncogenic Stimulus
Hearnes, Jamie M.; Pietenpol, Jennifer; Sep. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0605
Report No.(s): AD-A434620; No Copyright; Avail: CASI; A02, Hardcopy

One of the most frequent alterations in breast cancer is deregulation of the p53 tumor suppression signaling pathways. The tumor suppressor p53 is a sequence-specific transcription factor that is activated in response to various cellular stresses. It has been predicted that there are hundreds of consensus p53 binding sites present in the human genome. To date, numerous seminal p53 target genes have been identified, leading to the further elucidation of the role of p53 in tumor suppression. However, only a subset of p53 target genes has been identified to date, and characterization of p53 signaling pathways in their entirety is not yet complete. The goal of this study is to further define and characterize such pathways through the identification of novel genes that are directly regulated by p53. Using chromatin immunoprecipitation followed by a yeast selection system we have isolated over 100 genomic DNA fragments other that contain novel p53 binding sites. The new DNA fragments obtained have been mapped to various regions of the human genome, and putative novel p53 target genes have been identified, validated, and characterization is ongoing. This research will lead to a more complete understanding of p53-regulated signaling pathways in mammary epithelial cells.
DTIC
Breast; Cancer; Carcinogens; Epithelium; In Vivo Methods and Tests; Mammary Glands; Tumor Suppressor Genes; Tumors

20050195909 Agency for Healthcare Research and Quality, Rockville, MD USA
Post-Fielding Surveillance of a Guideline-Based Decision Support System
Chan, Albert S.; Martins, Susana B.; Coleman, Robert W.; Bosworth, Hayden B.; Oddone, Eugene Z.; Shlipak, Michael G.; Tu, Samson W.; Musen, Mark A.; Hoffman, Brian B.; Goldstein, Mary K.; May 2005; 10 pp.; In English
Report No.(s): AD-A434624; No Copyright; Avail: Defense Technical Information Center (DTIC)

Quality assurance (QA) processes for new technologies are used to ensure safety. Clinical decision support systems (DSS), identified by the Institute of Medicine (IOM) as an important tool in preventing patient errors, should undergo similar predeployment testing to prevent introduction of new errors. Post-fielding surveillance, akin to post-marketing surveillance for adverse events, may detect rarely occurring problems that appear only in widespread use. To assess the quality of a guideline-based DSS for hypertension, ATHENA DSS, researchers monitored real-time clinician feedback during point-of-care use of the system. Comments (n=835) were submitted by 44 of the 91 (48.4 percent) study clinicians (median 8.5 comments/clinician). Twenty-three (2.8 percent) comments identified important, rarely occurring problems. Timely analysis of such feedback revealed omissions of medications, diagnoses, and adverse drug reactions due to rare events in data extraction and conversion from the electronic health record. Analysis of clinician-user feedback facilitated rapid detection and correction of such errors. Based on this experience, new technologies for improving patient safety should include mechanisms for post-fielding QA testing.
DTIC
Conditions; Decision Support Systems; Hazards; Management Systems; Medical Services; Quality Control; Surveillance

20050195910 Washington Univ., Seattle, WA USA
Genetic Factors that Affect Tumorigenesis in NF1
Stephens, Karen G.; Nov. 2004; 36 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0542
Report No.(s): AD-A434628; No Copyright; Avail: CASI; A03, Hardcopy

Neurofibromatosis type 1 affects 1/4000 individuals worldwide and predisposes to the growth of both benign and malignant tumors. Our research is focused on NF1 microdeletions that are associated with an early onset, and subsequent heavy burden, of cutaneous neurofibromas and predispose to MPNST. We found that these deletions arise by homologous recombination between 51 kb repeat elements (NR1REP) that flank the NF1 gene. We identified recombination hotspots where 69% of NF1 microdeletions occur and developed robust and sensitive assays to detect microdeletions in a patient blood sample. We analyzed the structure and sequence of four NFIREP paralogs in the genome and described sequence features that may mediate recombination at these sites. We developed new quantitative PCR assays that will detect nonrecurrent NF1 microdeletions that occur either in the germline or in somatic tissues including tumors. Our data make substantial contributions to understanding how NF1 microdeletions occur, create important assays and resources to determine whether some individuals are more susceptible, and which deleted sequences may cause the severe tumor phenotype of these patients.
DTIC
Assaying; Blood; Detection; Genetics

20050195911 California Univ., Berkeley, CA USA
Compact Positron Tomograph for Prostate Imaging
Huber, Jennifer S.; Jan. 2005; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0081
Report No.(s): AD-A434630; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goal of this project is to construct a functioning compact positron tomograph, whose geometry is optimized for detecting prostate tumors with molecular tracers such as 11Ccholine (carbon-11 choline), in order to confirm the presence, absence or progression of prostate cancer. The camera consist of two banks of detectors mounted in a gantry. The bottom bank is fixed below the patient bed, and the top bank moves upward for patient access and downward for maximum sensitivity. The camera design was optimized, and extensive simulations were used to evaluate the expected camera performance. The camera was constructed. An iterative reconstruction algorithm was developed and tested with real data. Initial camera performance characterization was completed by imaging several phantoms with the system. Reconstructed images of extended and point source phantoms, using the completed camera in 3D-mode operation, demonstrate the feasibility of imaging prostate tumors with good spatial resolution and image contrast. The reconstruction algorithm will be fully optimized, the septa will be built and installed, and all NEMA phantom imaging will be completed by April, 2005.
DTIC
Cancer; Detection; Imaging Techniques; Positrons; Prostate Gland; Tomography

20050195912 Torrey Pines Inst. for Molecular Studies, San Diego, CA USA
Development of Peptide Antagonists of Chemokine Receptors Involved in Breast Cancer Metastasis
Blondelle, Sylvie E.; Mar. 2005; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0654
Report No.(s): AD-A434632; No Copyright; Avail: CASI; A02, Hardcopy

Breast cancer cells where shown to express functionally active chemokine receptors that may promote metastasis, and an anti-human CXCR4 chemokine receptor monoclonal antibody was found to reduce the level of lung metastasis by 61-68 percent. Based on these findings supporting the role for chemokine ligand-receptor interactions in promoting metastasis of breast cancer, we develop small molecule antagonists to CXCR4. This was accomplished by screening in a competitive assay synthetic combinatorial libraries (SCLs) made up of D-amino acid peptides for their ability to antagonize CXCR4 receptor function using HeLa cells and PBMC cells (used as standard), and breast cancer cells (MDA-MB-231 and DU4475, known to express CXCR4), and a monoclonal antibody anti-CXCR4 known to block chemotaxis induced by CXCL12 (formerly known as SDF-1_). The SCL approach, particularly when generated in a positional scanning (PS) format, allows the direct identification of the key residue(s) of active peptide sequence(s) from the library screening. Following the screening of a library, candidate sequences were synthesized and their inhibitory activity on the binding of anti-CXCR4 antibody was evaluated as well as their ability to abrogate the migratory response of cells inducted by SDF-1_.
DTIC
Antibodies; Breast; Cancer; Combinatorial Analysis; Mammary Glands; Metastasis; Peptides

20050195913 Johns Hopkins Univ., Baltimore, MD USA
Generation of Transgenic Animals Producing Ezymatically Active Prostate-Specific Antigen (PSA) in Normal and Malignant Prostate Tissue
Denmeade, Samuel R.; Feb. 2005; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0012
Report No.(s): AD-A434635; No Copyright; Avail: CASI; A02, Hardcopy

Prostate-specific antigen (PSA) is used extensively as a serum marker to screen for prostate cancer and is also used as a surrogate marker to assess response to therapy for prostate cancer. The physiologic role of PSA in normal prostate biology is uncertain but the protein appears to play a role in reproduction by enhancing sperm mobility. PSA is a serine protease with chymotrypsin-like specificity. PSA, through it proteolytic activity, may plan an important role in prostate cancer progression, invasion, angiogenesis, and/or metastasis. To date, no lab has successfully produced a mammalian cell line that makes large amounts of enzymatically active PSA. This inactivity appears to be due to lack or, or incomplete processing of, Pro-PSA to the active form, presumably due to the absence of the necessary processing protease. Currently available prostate cancer cell lines and mouse models producing enzymatically inactive PSA are not useful for developing these prodrug therapies or for understanding the role of PSA in the biology of prostate cancer. we have generated a modified PSA gene that was used to generate cell lines that produce much higher levels of total PSA and most of this PSA is enzymatically active. This PSA gene was used to generate mice that produce PSA in their prostates. These mice can be used to study role of PSA in biology of prostate cancer and to test PSA-activated prodrug therapies.
DTIC
Animals; Antigens; Cancer; Enzymes; Peptides; Prostate Gland; Protease

20050195914 Washington Univ., Seattle, WA USA
Quest: A New Approach to Molecular Staging of Tumors
Stephens, Karen G.; Aug. 2004; 54 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0721
Report No.(s): AD-A434636; No Copyright; Avail: CASI; A04, Hardcopy

Lack of a definitive system for the diagnosis and staging of NF1-related tumors is a major obstacle to investigating the molecular basis of tumorigenesis, to our ability to assess prognosis, and consequently, to the rational design and application of stage-specific therapeutic agents (1-3). Locus-specific changes in copy number are a common feature of many types of tumors, including the neurofibromas and malignant peripheral nerve sheath (MPNST) that develop in individuals with NF1 (4-13). Gains or losses at a particular locus are (reviewed in (4) potential biomarkers for the molecular diagnosis and grading of MPNST. Towards the goal of molecular diagnosis and staging of NF1-related tumors, we propose to develop and validate a novel polymerase chain reaction (PCR)-based method, termed QuEST, for rapid and quantitative identification of loci with increases or decreases in genomic copy number in MPNST.
DTIC
Fibrosis; Neoplasms; Neurophysiology; Tumors

20050195915 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Interferon Alfacon1 is an Inhibitor of SARS-Corona Virus in Cell-Based Models, Antiviral Research
Paragas, Jason; Blatt, Lawrence M.; Hartmann, Chris; Huggins, John W.; Endy, Tim P.; Jan. 2005; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434642; RPP-05-260; No Copyright; Avail: Defense Technical Information Center (DTIC)

Preliminary data examining interferon alfacon1 treatment of SARS-CoV (severe acute respiratory syndrome - corona virus)-infected patients suggests this therapy is well tolerated and of therapeutic benefit. We report herein that interferon alfacon1, has potent in vitro antiviral activity against SARS-CoV. In a cytopathic effect (CPE) assay, interferon alfacon1 inhibited the generation of CPE in a dose-dependent manner with an IC50 of 0,001 g/ml, a clinically achievable level. Furthermore, interferon alfacon1 also demonstrated significant antiviral activity in yield reduction and plaque reduction assays. The in vitro activity of interferon alfacon1 against SARS CoV suggests continued evaluation of interferon alfacon1 as a therapeutic treatment for patients infected with SARS-CoV.
DTIC
Coronas; Drugs; Inhibitors; Interferon; Viruses

20050195917 Pennsylvania Univ., Philadelphia, PA USA
Quality of Life and Cost Effectiveness of Prostate Cancer Treatment
Jayadevappa, Ravishankar; Mar. 2005; 71 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0257
Report No.(s): AD-A434650; No Copyright; Avail: CASI; A04, Hardcopy

The objective of this study is to assess the effects of differential treatments for prostate cancer on quality of life and cost of care for two ethnic groups. It will also include comparison of efficiency and HRQoL for men with prostate cancer offered in two health care systems: Veterans Affairs (VA-public) and non-Va (UPHS-private).
DTIC
Cancer; Cost Effectiveness; Life (Durability); Life Cycle Costs; Medical Services; Prostate Gland

20050195918 Michigan Univ., Ann Arbor, MI USA
Structure-Based Discovery and Testing of Non-Peptide, Cell-Permeable Small Molecule Inhibitors of STAT-3 as a Potential Novel Therapy for Breast Cancer
Wang, Shaomeng; Jul. 2004; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0508
Report No.(s): AD-A434651; No Copyright; Avail: CASI; A03, Hardcopy

The constitutive activation of Stat3 is frequently detected in human breast cancer cell lines as well as in clinical breast cancer specimens and may play an important role in oncogenesis of breast carcinoma. Activated Stat3 may participate in oncogenesis by stimulating cell proliferation, promoting tumor angiogenesis, and resisting to apoptosis. Hence, Stat3 represents an attractive target for cancer therapy. In this study, of the nearly 429,000 compounds screened by virtual database screening, chemical samples of top 100 compounds identified as candidate small molecule inhibitors of Stat3 were evaluated using Stat3-dependent luciferase reporter as well as other cell-based assays. Through serial functional evaluation based on our established cell-based assays, one compound, termed Sta-21 inhibits Stat3 DNA binding activity, Stat3 dimerization, and Stat3-dependent luciferase activity. Moreover, Sta-21 reduces the survival of breast carcinoma cells with constitutive Stat3 signaling but has minimal effect on the cells in which constitutive Stat3 signaling is absent. Together, these results demonstrate that Sta-21 inhibits breast cancer cells that express constitutive active Stat3. Sta-21 may have a therapeutic potential to be developed as a new class of anti-cancer drug for the treatment of human cancer with activated Stat3.
DTIC
Angiogenesis; Breast; Cancer; Clinical Medicine; Drugs; Inhibitors; Mammary Glands; Peptides; Therapy; Tumors

20050195919 Department of the Army, Washington, DC USA
NATO Handbook on the Medical Aspects of NBC Defensive Operations AMedP-6(B)
Feb. 1996; 443 pp.; In English
Report No.(s): AD-A434662; FM-8-9; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this handbook is to provide a guide for medical officers on the medical aspects of NBC operations. The handbook is intended as a compilation of reference material and as a source of information for training. It does not constitute an official position of NATO nations; certain aspects, however, are already covered by STANAGs and this is being extended.

In addition, it provides the basic philosophy for the development of concepts of operations and in the management, including evacuation and treatment, of NBC casualties as well as conventional battle casualties in an NBC environment. There are many unresolved problems and it must be appreciated that a number of the philosophical concepts presented are provisional; their validity will require reassessment in the light of future trials and exercises. The handbook is in three parts, Part I-Nuclear, Part II-Biological, and Part III-Chemical. Each part is self-contained and presented separately. There is some necessary overlap and several aspects are common to all three, for example: combined injuries; the effect of radiation on the response to infection and on the healing of thermal and chemical burns; psychological factors and morale; public health aspects; and medical care in a mass casualty situation. It should be noted that detailed information on the treatment of burns and traumatic injuries is contained in the Emergency War Surgery Handbook covered by STANAG 2068, which should be used in conjunction with this handbook.
DTIC
Education; Handbooks; Medical Services; Military Operations; North Atlantic Treaty Organization (NATO); Protection

20050195934 Agency for Healthcare Research and Quality, Rockville, MD USA
A Clinical Assessment Program to Evaluate the Safety of Patient Care
Snow, Richard J.; Levine, Martin S.; Harper, Dwain L.; McGill, Sharon L.; Thomas, George; McNerney, Joseph P.; Jan. 2005; 15 pp.; In English
Report No.(s): AD-A434698; No Copyright; Avail: Defense Technical Information Center (DTIC)

The American Osteopathic Association's Clinical Assessment Program (AOACAP) provides a mechanism for osteopathic residency programs to measure and improve their quality of patient care. In CAP, current clinical practices are measured, and then compared, to evidence-based practice guidelines representing state-of-the-art professional standards, such as The National Committee on Quality Assurance (NCQA) Health Plan Employer Data and Information Set (HEDIS), Healthy People 2010 targets, and recommendations from the American Diabetes Association. In this program, data abstracted directly from patients' medical records are analyzed to determine the residents' performance as well as the impact and effectiveness of residency program treatment protocols in meeting standards of practice for certain clinical categories of patients. These categories are women's health, childhood immunizations, adult immunizations, low back pain, hypertension, coronary artery disease, and diabetes mellitus. All osteopathic family practice programs are required to participate in the AOA-CAP program as part of the accreditation process. This information is then used, when necessary, to modify residents' clinical behavior and teaching programs. Improvement is documented through re-evaluation. Our results thus far support the suggestion of NCQA that significant 'quality gaps' exist. By reducing these quality gaps, which, according to NCQA, result in more than 57,000 U.S. deaths annually, patient safety is certainly being advanced. Through a platform of process sharing, the AOA-CAP provides specific information to residency program directors about how to improve the quality of patient care.
DTIC
Clinical Medicine; Health; Patients; Safety

20050195935 Lund Univ., Sweden
Developing Human Embryonic Stem Cells for Grafting in Parkinson's Disease
Brundin, Patrik; Mar. 2005; 26 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0366
Report No.(s): AD-A434700; No Copyright; Avail: CASI; A03, Hardcopy

The project aims to differentiate human embryonic stem cells (hESCs) into dopaminergic neurons for use in neural grafting in Parkinson's disease (PD). During the first year we studied the survival and differentiation potential of hESCs implanted into a rat model of PD. hESCs were differentiated on PA6 feeders for 16, 20 and 23 days prior to grafting. The number of neurons and dopaminergic cells increased with time in vitro. 100,000 viable cells were grafted into the striatum of immunosuppressed 6-OHDA-lesioned rats. The grafted hESCs-derived cells survived well in all groups. Substantial number of surviving cells differentiated into neurons (NeuN positive) but very few hESC-derived TH positive neurons were observed in most transplanted rats. Amphetamine-induced rotational behavior was tested at weeks 2, 4, 8 and 13 after transplantation. No behavioral recovery was observed. Importantly, the rats grafted with hESCs differentiated for 16 days developed severe teratomas staring from 6 weeks post-transplantation, while most rats grafted with hESCs differentiated in vitro for longer periods kept healthy until the end of the experiment. This indicates that differentiated hESCs can survive and retain neuronal phenotype after transplantation despite low numbers of dopaminergic neurons and that the differentiation of pre-transplantation is essential to prevent teratoma-formation.
DTIC
Diseases; Embryos; Grafting; Stem Cells; Transplantation

20050195940 Maryland Univ., Baltimore, MD USA
Neurotrophin Therapy of Neurodegenerative Disorders with Mitochondrial Dysfunction
Bambrick, Linda L.; Sep. 2004; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0745
Report No.(s): AD-A434706; No Copyright; Avail: CASI; A03, Hardcopy

This research program will determine whether accelerated neuron death due to increased oxidative stress resulting from mitochondrial dysfunction can be compensated or corrected by neurotrophin stimulation. The experiments will be carried out in two models of mitochondrial dysfunction. 1)hippocampal neurons from the trisomy 16 mouse, which undergo increased apoptosis and have a mitochondrial defect, that has now been identified as a decrease in Complex I-mediated respiration and 2)neurons chronically treated with the neurotoxin rotenone to induce a defect in mitochondrial function. 0.1-0.5 nM rotenone treatment has now been shown to leave hippocampal neurons vulnerable to a second oxidative stress. A unique aspect of this approach is that the neuronal responsiveness to brain derived neurotrophic factor (BDNF) will be enhanced by overexpressing the BDNF receptor via an andenovirus vector, resulting in an increase in sensitivity to BDNF. Such neurons would be expected to have an enhanced survival response to endogenous BDNF and may be more resistant to oxidative stress characteristic of Parkinson's disease and other neurodegenerative disorders.
DTIC
Brain; Cells (Biology); Mitochondria; Nervous System; Neurons; Oxidation; Therapy

20050195942 Texas Univ., Houston, TX USA
Vasculature-Specific Adenovirus Vectors for Gene Therapy of Prostate Cancer
Krasnykh, Victor; Feb. 2005; 10 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0200
Report No.(s): AD-A434708; No Copyright; Avail: CASI; A02, Hardcopy

In Year 1 of the project we have completed Task 1 (as per approved Statement of Work) by generating a panel of plasmid vectors for the expression of a series of modified adenovirus fiber genes. These genes encode genetic fusions of the adenovirus fiber protein, which has been stripped off its native receptor binding site by mutagenesis, with the previously identified peptides that are specific for the prostate tumor vasculature. The resultant proteins have been transiently expressed in cultured human cells and characterized by Western blot analysis. As a result of this work, we have identified those fiber-peptide fusion proteins that retain the trimeric structure of native adenovirus fiber protein and, thus, can be incorporated into the capsid of Ad vector for tumor targeting.
DTIC
Adenoviruses; Cancer; Endothelium; Gene Therapy; Prostate Gland

20050195943 Agency for Healthcare Research and Quality, Rockville, MD USA
A Strategic Approach for Funding Research: The Agency for Healthcare Research and Quality's Patient Safety Initiative 2000-2004
Keyes, Margaret A.; Ortiz, Eduardo; Queenan, Deborah; Hughes, Ronda; Chesley, Francis; Hogan, Eileen M.; Jan. 2005; 17 pp.; In English
Report No.(s): AD-A434709; No Copyright; Avail: Defense Technical Information Center (DTIC)

Medical errors result in considerable morbidity, mortality, and costs to the health care system. Regardless, research efforts to understand and improve patient safety received relatively little attention or funding prior to 2001. While the Agency for Healthcare Research and Quality (AHRQ) has historically funded some research on patient safety, much of that support was driven by a small number of highquality investigator-initiated research projects. With the increased focus on patient safety stimulated by the release of the Institute of Medicine's (IOM) 1999 report, To Err Is Human, and with a substantial budget increase from the U.S. Congress directed toward patient safety, AHRQ embarked on a strategic approach to develop a large, targeted patient safety research initiative.* The main focus of this initiative was a series of six research solicitations developed in response to recommendations in the IOM's report and input from a wide variety of stakeholders convened at a national patient safety research summit. This article describes those six patient safety solicitations, illustrates their potential to improve the safe delivery of health care, and reveals a number of remaining research gaps. The paper also describes a select number of related and follow-on activities undertaken by AHRQ to address the critical issue of patient safety, including a new allocation of funding for health care information technology and its potential for improving patient safety.
DTIC
Costs; Health; Medical Science; Medical Services; Patients; Safety

20050195944 Department of Veterans Affairs Research Foundation, Portland, OR USA
Fish Oil Supplementation and Fatty Acid Synthase Expression in the Prostate: A Randomized Controlled Trial
Shannon, Jackilen; Mar. 2005; 11 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0296
Report No.(s): AD-A434711; No Copyright; Avail: CASI; A03, Hardcopy

One in seven men over age 60 will be diagnosed with prostate cancer. Elucidation of early cellular changes that may predict progression to prostate cancer and the identification of factors that may inhibit or reverse these cellular changes would be of great clinical significance. Dysregulation of lipid metabolism is an early cellular change that has recently come under investigation. Two lipid pathways will be explored in this study; 1)over-expression of the lipogenic enzyme fatty acid synthase (FAS) and 2) cholesterol accumulation in the specialized plasma membrane lipid rafts. Lipid rafts are rich in proteins that mediate signal transduction and are markers for aggressive prostate cancer. Cell culture research has demonstrated that dietary supplementation with polyunsaturated fatty acids, particularly omega-3 fatty acids, decreases expression of FAS and may alter the integrity of lipid raft formation. Treatment with cholesterol-lowering drugs, statins, has also been shown in animals to inhibit lipid raft formation and induce tumor cell death. We will conduct a randomized placebo-controlled study to evaluate the effect of fish oil, statin use and fish oil plus statin versus placebo on FAS expression and lipid raft composition in benign, pre-neoplastic and neoplastic prostate tissue from men undergoing repeat prostate biopsy.
DTIC
Cancer; Fatty Acids; Fishes; Lipid Metabolism; Oils; Prostate Gland

20050195945 University of Southern California, Los Angeles, CA USA
Improving Detection of Axillary Lymph Nodes by Computer-Aided Kinetic Feature Identification in Positron Emission Tomography
Yu, Xiaoli; Aug. 2004; 83 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9379
Report No.(s): AD-A434712; No Copyright; Avail: CASI; A05, Hardcopy

The goal of this project is to improve detection of metastatic axillary breast cancer through sophisticated physiological modeling and statistical signal processing techniques. The major focus of this project was to explore temporal physiological differences in malignant and normal tissues based on the advanced FDG-PET kinetic modeling assessment; assess and improve the accuracy of ROI-based molecular feature extraction techniques from the known primary breast tumor; design the space-temporal filtering and detection criteria to identify the early metastases from severe background interference and count noise; integrate the developed feature extraction and filtering/detection criteria into a software prototype of Intelligent Detection of Early Metastasized Molecular Feature (IDEMMF) system; and test and evaluate the prototype with phantom, animal study and clinical patient study. Our theoretical findings include mathematically map of the physiological differences in temporal domain onto the kinetic (macro) parameter domain; revealing and characterization of the temporal or parametric domain differences in frequency domain and time-frequency. The evaluations on a small scale of animal and patient data show that the IDEMMF system can significantly enhance the metastatic lesion detection by exploring the temporal differences in dynamic FDG-PET images.
DTIC
Breast; Cancer; Computer Techniques; Detection; Lymphatic System; Mammary Glands; Positrons; Tomography

20050195947 Agency for Healthcare Research and Quality, Rockville, MD USA
Speaking Plainly: Communicating the Patient's Role in Health Care Safety
Miranda, David J.; Zeller, Paula K.; Lee, Rosemary; Koepke, Christopher P.; Holland, Howard E.; Englert, Farah; Swift, Elaine K.; Jan. 2005; 13 pp.; In English
Report No.(s): AD-A434715; No Copyright; Avail: Defense Technical Information Center (DTIC)

The development and testing of a patient fact sheet entitled Five Steps to Safer Health Care illustrate important research considerations associated with the process of crafting messages to help patients reduce health care system errors and improve the safety of their care. The basis for the fact sheet was a larger set of messages drawn from a review of the health care literature by the Agency for Healthcare Research and Quality. Researchers at the Centers for Medicare & Medicaid Services conducted testing to determine which messages resonated with Medicare beneficiaries, explored the beneficiaries relationships with their health care providers, and considered how that context might affect their responses to the messages. Researchers tested the resulting patient fact sheet with physicians to better understand their potential reactions and to formulate strategies for disseminating and promoting the product. Potential cultural differences were identified and discussed with Spanish-dominant consumers (i.e., persons who prefer speaking in Spanish, regardless of their ability to speak English) to enhance

development of an effective Spanish-language version of the patient fact sheet. This body of research studies suggested not only which messages to emphasize, but also which secondary audiences to target, and how Spanish-dominant consumers might differ from others in their understanding and use of these health messages. Findings from these studies also indicated some opportunities for and barriers to promoting the messages.
DTIC
Communicating; Health; Management Systems; Medical Services; Patients; Safety

20050195949 Agency for Healthcare Research and Quality, Rockville, MD USA
Physician Use of Hand-Held Computers for Drug Information and Prescribing
Galt, Kimberly A.; Siracuse, Mark V.; Rule, Ann M.; Clark, Bartholomew E.; Taylor, Wendy; Jan. 2005; 17 pp.; In English
Report No.(s): AD-A434717; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this study was to develop and pilot-test an instrument that determines the relationship between perceptions, intended use, and actual use of the personal digital assistant (PDA) by primary care physicians for drug information access and prescribing. The instrument studied addressed human factor limitations, attitudes toward learning to use the PDA, and fear of losing either confidential information or the PDA itself. The study instrument was intended to differentiate between applications a physician will or will not incorporate into daily practice and to predict which physicians are more likely to successfully adopt use of a PDA. A 63-item survey was administered at baseline to 78 primary care physicians, randomized into control and intervention groups. The physicians in the intervention group were provided a PDA with electronic prescribing software and drug information software, training in the use of the device and the software, and an infrared printer to write prescriptions. They were then asked to prescribe using the PDA or by hand, as they preferred. The control group physicians continued traditional handwritten prescribing and accessed their usual drug information sources. The survey was readministered to both groups after they had completed 500 prescriptions. Postintervention data did not support ready acceptance of the PDA as a prescribing device; however, the physicians did find the PDA useful for accessing drug information at the point of care. Potential factors that predict physician use of the PDA were learning-related attitudes, human factor limitations, and concerns about loss of confidential and critical information.
DTIC
Computers; Digital Computers; Drugs; Physicians; Portable Equipment; Telemedicine

20050195951 Agency for Healthcare Research and Quality, Rockville, MD USA
An Employee Questionnaire for Assessing Patient Safety in Outpatient Surgery
Carayon, Pascale; Alvarado, Carla J.; Hundt, Ann S.; Springman, Scott; Borgsdorf, Amanda; Hoonakker, Peter L.; Jan. 2005; 14 pp.; In English
Report No.(s): AD-A434720; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper provides information on the reliability and validity of an employee questionnaire developed in a study of patient safety in outpatient surgery. The Systems Engineering Intervention in Outpatient Surgery (SEIPS), a collaborative community perspective project currently underway at the University of Wisconsin-Madison, examines the impact of a systems engineering intervention on both employees and patients. In this paper, we describe the SEIPS employee questionnaire, which surveys various elements of the work system (e.g., communication, workplace, supplies, and patient safety climate), the care process, and employee outcomes (e.g., job satisfaction, stress, perceived quality and safety of care provided). Data from a sample of 289 staff members in 5 outpatient surgery centers (53 percent response rate) are used to examine reliability, construct validity, convergent validity, and predictive validity. The results provided evidence for the reliability and validity of the SEIPS study's employee questionnaire.
DTIC
Clinical Medicine; Medical Personnel; Medical Services; Patients; Personnel; Safety; Surgery

20050195952 Agency for Healthcare Research and Quality, Rockville, MD USA
Best Practices for Medical Technology Management: A U.S. Air Force-ECRI collaboration
Keller, James P., Jr.; Walker, Stephen; Jan. 2005; 12 pp.; In English
Report No.(s): AD-A434725; No Copyright; Avail: Defense Technical Information Center (DTIC)

For more than 25 years, the U.S. Air Force has contracted ECRI, an independent and nonprofit health services research agency, to disseminate patient safety medical device information to key staff at all Air Force hospitals worldwide. The nature of the information includes product recalls, notices regarding medical device hazards, product evaluations, guidance on the safe selection and use of medical devices, and systematic processes for managing hazards and recalls in an institutional health

care environment. The information is used by biomedical engineering professionals, logistics personnel, clinicians, and administrators in support of the medical technology management programs in their hospitals. This article will discuss the use of this information in Air Force clinical facilities and the role of the Air Force Medical Logistics Office (AFMLO) in this communication process. It also will examine new electronic tools for managing medical device hazards, recalls, and other device-related patient safety information. The program featured in this discussion central to the Air Force's longstanding commitment to appropriate and consistent medical device safety management at each of its hospitals. It is a program that relies heavily on independent investigation to clarify medical device problems, including unbiased research into device performance and comparative product evaluations. Standardized naming conventions are used for hazard and recall notifications. Additionally, inventory databases are used to identify problematic devices in each hospital, while technical experts on a wide variety of medical technologies give consideration to the suspect devices. The Air Force collaboration with ECRI has led to the development of a best practice for the management and dissemination of medical device patient safety information from which the entire health care industry can benefit.
DTIC
Biotechnology; Hazards; Medical Equipment; Medical Services; Procedures; Safety

20050195957 Agency for Healthcare Research and Quality, Rockville, MD USA
The San Diego Center for Patient Safety: Creating a Research, Education, and Community Consortium
Pratt, Nancy; Vo, Kelly; Ganiats, Theodore G.; Weinger, Matthew B.; Jan. 2005; 13 pp.; In English
Contract(s)/Grant(s): P20-HS11521
Report No.(s): AD-A434731; No Copyright; Avail: Defense Technical Information Center (DTIC)
In response to the Agency for Healthcare Research and Quality's Developmental Centers of Education and Research in Patient Safety grant program, a group of clinicians and academicians proposed the San Diego Center for Patient Safety (SDCPS). The Center is remarkable not only because of the original group s diversity, but also because few members knew of their common interest. In its two and a half year history, the Center has grown to over 100 members from 20 disciplines, sponsored two countywide safety conferences, catalyzed the creation of a consortium of the local healthcare systems, and performed innovative research. While the breadth and depth of local expertise contributed to our successes, there were many roadblocks. This paper describes the creation of SDCPS and its affiliated organizations, addresses the challenges of establishing a community patient safety collaborative, delineates some obstacles to long-term success, and presents some of the lessons we have learned from this endeavor.
DTIC
Clinical Medicine; Education; Health; Organizations; Patients; Safety

20050195958 National Inst. of Health, Bethesda, MD USA
Placebo Controlled Study of Repetitive Transcranial Magnetic Stimulation for the Treatment of Parkinson's Disease
Hallett, Mark; Mar. 2004; 13 pp.; In English
Contract(s)/Grant(s): MIPR-2GCDGG2091
Report No.(s): AD-A434733; No Copyright; Avail: CASI; A03, Hardcopy
During the period of the study, we researched the effects of 25 Hz rTMS in 20 patients with Parkinson's disease (PD). Eight-rTMS sessions were performed over a four-week period. Four cortical targets were stimulated in each of the sessions (left and right motor and dorsolateral prefrontal cortex) with 300 pulses each. Cumulative improvement of balance and gait, reduction of upper limb bradykinesia were observed in the course of the rTMS sessions. This manifested itself by a decrease of the time needed to execute motor test. Therapeutic rTMS effect lasted for at least one month after the end of the treatment. rTMS used under the parameters of the regimen is sage in patients with PD.
DTIC
Cerebral Cortex; Diseases; Stimulation

20050195959 Agency for Healthcare Research and Quality, Rockville, MD USA
Outpatient Surgery and Patient Safety-The Patient's Voice
Hundt, Ann S.; Carayon, Pascale; Springman, Scott; Smith, Maureen; Florek, Kelly; Sheth, Rupa; Dorshorst, Margaret; Jan. 2005; 16 pp.; In English
Report No.(s): AD-A434736; No Copyright; Avail: Defense Technical Information Center (DTIC)
Four outpatient surgery centers from a large Midwestern community participated in this study assessing the impact of an intervention-aimed at improving the collection of patients' pre-operative clinical information-on both the patients' clinical

outcomes and staffs' quality of working life. As part of this study the investigators developed a patient telephone survey to assess the incidence of common or undesirable postoperative symptoms and how they were subsequently managed. This survey was adapted from instruments developed in previous work in outpatient follow-up and anesthesiology. In addition to symptom assessment and management, the investigators were interested in determining how participants rated their medication teaching, pre-operative preparation, and postoperative education. The investigators recruited patients to participate in this study who had ophthalmic, open-joint, otolaryngological (ear, nose, and throat), or intra-/extra-abdominal surgery. The investigators contacted the participants via telephone at least 7 days after surgery and asked them a series of questions about symptoms they experienced, how they managed these symptoms, and the education they received. This paper will detail the development and content of the patient survey.
DTIC
Clinical Medicine; Medical Services; Patients; Safety; Surgery

20050195964 Agency for Healthcare Research and Quality, Rockville, MD USA
A Nonpunitive, Computerized System for Improved Reporting of Medical Occurrences
Arroyo, Dale A.; Jan. 2005; 11 pp.; In English
Report No.(s): AD-A434745; No Copyright; Avail: Defense Technical Information Center (DTIC)

To improve the patient safety program at the Naval Hospital at Oak Harbor, the facility instituted a new computerized system of reporting errors, incorporating a nonpunitive approach. The new Culture of Safety led to a paradigm shift in assessing an individual's performance, event occurrences, and error reporting. Prior to the patient safety initiative, under the then-existing error reporting system, staff members at the Naval Hospital at Oak Harbor were held personally accountable and subject to discipline for errors they committed. Under the Culture of Safety program, most errors are considered preventable and attributable to systems issues. The new reporting system is used to assess systems failures, not individual performance. Staff may input errors and occurrences directly into the computerized database or submit paper reports. Although anonymous reporting is allowed, staff members are encouraged to identify themselves. Reviewers comment on the errors and occurrences reported to help identify trends and develop baselines for quality improvement activities. Ultimately, the appointed physician advisor for performance improvement summarizes what actions are needed to remediate the problem. The new system provides up-to-the-minute information for review, dissemination, and action, replacing the paper trails and time-consuming meetings that failed to resolve occurrences. Data collected provides feedback to department heads, allowing for monitoring, systems improvement, or environmental changes. Aggregate data are tracked, trended, and fully disseminated.
DTIC
Computer Techniques; Hospitals; Medical Services; Patients; Safety

20050195967 Agency for Healthcare Research and Quality, Rockville, MD USA
A Process-Centered Tool for Evaluating Patient Safety Performance and Guiding Strategic Improvement
Akins, R. B.; Jan. 2005; 18 pp.; In English
Report No.(s): AD-A434750; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents a patient safety applicator tool for implementing and assessing patient safety systems in health care institutions. The applicator tool consists of critical processes and performance measures identified in the context of the 2003 Malcolm Baldrige National Quality Award (MBNQA) Health Care Criteria for Performance Excellence. The Delphi technique was used for gaining consensus from a group of experts and forecasting significant issues in the field of the Delphi panel's expertise. Data collection included a series of questionnaires where the first-round questionnaire was based on literature review and the MBNQA criteria for excellence in health care. Data were tested by an instrument review panel of experts. Twenty-three experts (MBNQA health care reviewers and senior health care administrators from quality award winning institutions) representing 18 States participated in the survey rounds. The study addressed three research questions: 1. What critical processes should be included in health care patient safety systems? 2. What performance measures can serve as indicators of quality for the processes critical for ensuring patient safety? 3. What processes will be critical for patient safety in the future?
DTIC
Health; Medical Services; Patients; Safety

20050195976 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
The Role of Costimulatory Molecules in the Development of Memory and Effector T Helper 2 Cells During an in vivo Immune Response to the Murine Gastrointestinal Parasite Heligmosomoides polygyrus
Ekkens, Melinda; Sep. 2002; 72 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434766; No Copyright; Avail: Defense Technical Information Center (DTIC)

Previous studies have demonstrated the importance of costimulatory interactions for effector CD4+ T helper (Th) cell development during the primary immune response. However, the role of costimulatory molecules in memory CD4+ T cell differentiation is not well understood. One model used to study the Th immune response involves oral infection of mice with the gastrointestinal nematode parasite Heligmosomoides polygyrus. Although the primary immune response to H. polygyrus is a chronic infection, challenge immunization triggers a T-dependent memory response that impairs adult worm maturation. In the studies presented herein, the effects of costimulatory molecule blockade on T helper effector cell function during the memory response were examined. Effector T cell development was inhibited during the primary response to H. polygyrus in B7-1/ B7-2-/- mice; however, memory Th cells developed that produced IL-4 and mediated effective reductions in adult worm egg production, but did not provide effective Ag-specific B cell help or support increased germinal center (GC) formation. Parallel studies in H. polygyrus-challenged CD28-/- mice demonstrated similar IL-4 elevations and decreases in adult worm egg production. However, Ag-specific Ab responses and increased GC formation were significantly restored in H. polygyrusinoculated CD28-/- mice. Although elevations in serum IgG1 and GC formation were intact in H. polygyrus-challenged OX40L-/- mice, elevations in IL-4 and serum IgE were partially inhibited, and associated with decreased worm expulsion and increased egg production. To further examine the role of OX40L in Ag-specific CD4+ T cell IL-4 production following priming, adoptively transferred OVA-specific DO11.10 T cells were analyzed in the context of the H. polygyrus response. Following immunization with OVA plus H. polygyrus, Ag-specific T cell expansion, celThese studies extt
DTIC
Control Equipment; Gastrointestinal System; Immunity; In Vivo Methods and Tests; Molecular Biology; Molecules; Parasites; Physiological Responses; Rodents

20050195982 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
An Interpreter's Interpretation: Sign Language Interpreters' View of Musculoskeletal Disorders
Johnson, William L.; Jan. 2003; 86 pp.; In English
Report No.(s): AD-A434773; No Copyright; Avail: Defense Technical Information Center (DTIC)

Sign language interpreters are at increased risk for musculoskeletal disorders. This study used content analysis to obtain detailed information about these disorders from the interpreters' point of view. Risk factors for the initiation and/or exacerbation of symptoms included the following: type of job or task, such as long work hours with few or no breaks, transliterating, finger spelling, tactile interpreting, and educational interpreting; interpreting style, such as poor body posture, tensing muscles, signing too forcefully; job control, including the emotional and physical stress of the job, being overworked, and disliking the job; ergonomic factors, such as poor seating or chair, standing while interpreting, temperature of the environment, and phone interpreting; and external factors, such as outside-of-work activities that contributed to the muscle pain (e.g., writing, typing, driving, carrying objects). Symptom management included self-care methods such as exercise, diet, and warm-up activities prior to interpreting. Coping strategies that were active, such as obtaining more control over one's work schedule, also were reported as helpful in alleviating symptoms. Additional management strategies included the use of complementary alternative medicine, the preventative use of exercise for upper extremity disorders, and the investigation of maximum exposure levels for interpreting situations. The results also highlight the need to investigate the clinical effectiveness of approaches such as acupuncture and the use of active coping behaviors in the prevention and management of these symptoms.
DTIC
Diseases; Health; Injuries; Musculoskeletal System; Risk; Signs and Symptoms; Symbols

20050195983 Chicago Univ., Chicago, IL USA
Structural Determination of Certain Novel ER Complexes
Wu, Ya-Ling; Greene, Geoffrey L.; Sep. 2004; 16 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0674
Report No.(s): AD-A434775; No Copyright; Avail: CASI; A03, Hardcopy

Tamoxifen is effective for the prevention and treatment of estrogen-dependent breast cancers, but is associated with an increased incidence of endometrial tumors. We completed the first aim of this proposal to solve the crystal structure of the estrogen receptor alpha ligand-binding domain (ER alpha LBD) bound to the structurally similar compound GW5638, which has therapeutic potential and does not stimulate the uterus. Like tamoxifen, GW5638 relocates the carboxy-terminal helix (H12) to the known coactivator-docking site in the ER alpha LBD. However, GW5638 repositions residues in H12 through specific contacts with the N-terminus of this helix. In contrast to tamoxifen, the resulting increase in exposed hydrophobic surface of ER alpha LBD correlates with a significant degradation of ER alpha in MCF-7 cells. Thus, the GW5638-ER alpha LBD structure reveals a unique mode of SERM-mediated ER antagonism, in which the stability of ER alpha is decreased

through an altered position of H12. This dual mechanism of antagonism may explain why GW5638 can inhibit tamoxifen-resistant breast tumors. In addition, difficulties encountered with experiments under aim 2 and 3 were addressed along with alternative approaches proposed in this report.
DTIC
Breast; Cancer; Estrogens; Mammary Glands; Therapy

20050195984 Mayo Clinic, Rochester, MN USA
Clinical and Functional Analyses of p73R1 Mutations in Prostate Cancer
Liu, Wanguo; Feb. 2005; 25 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0212
Report No.(s): AD-A434777; No Copyright; Avail: CASI; A03, Hardcopy

The DNA damage-signaling pathway has been implicated in the development of prostate cancer. Germline mutations in several genes (BRCA1, BRCA2, and CHEK2) whose products are involved in this pathway have been associated with increased risk for this disease. To identify additional genes in this pathway that might confer susceptibility to prostate cancer, we isolated a p73 up-regulated gene (p73R1) and screened this gene for mutations in prostate cancer. Two germline truncating mutations were identified. Genotyping of 403 men with sporadic prostate cancer for the two mutations showed a frequency of 3.2% (13/403) in contrast to 0.6% (2/327) in 327 population-based controls (Fisher's exact test, P=0.016), with an odds ratio of 5.4 (95% confidence interval 1.2-24.2). Analyses of 994 affected men from 444 familial prostate cancer families showed a relatively lower frequency of 1.6% but no mutations were found in 100 unaffected men from these families, indicating a similar trend observed for other comparisons. Overall, our data suggest that germline p73R1 truncating mutations may predispose men to prostate cancer and further supports the concept that the mutant alleles in the DNA damage-response genes play an important role in the development of sporadic prostate cancer.
DTIC
Cancer; Functional Analysis; Genes; Genetics; Mutations; Prostate Gland

20050195987 Medicine and Dentistry Univ. of New Jersey, Newark, NJ USA
Use of DNA Microarrays to Identify Diagnostic Signature Transcription Profiles for Host Responses to Infectious Agents
Ellner, Jerrold J.; Oct. 2004; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0787
Report No.(s): AD-A434780; No Copyright; Avail: CASI; A03, Hardcopy

Most of the likely agents of bio-terrorism have profound effects on the host and, in particular, on the immune and inflammatory responses. For many of these agents, pathogenesis has been studies at the cellular and molecular levels. These studies indicate that each specific organism has distinctive effects on the host immune and inflammatory cells that contributes to the unique clinical characteristics of the disease. These studies largely have focused on how the agent and its toxins and other constituents modulate host cell expression of individual cytokines and other molecules of interest as well as activation pathways. We have proposed a broad-based approach to identify the unique 'signatures' of infectious agents using host DNA micro-arrays. Because of the known diverse patterns of host cell interactions with these organisms, examination of the host transcriptional response has enormous potential to allow rapid diagnosis of infectious diseases in general and agents of bio-terrorism in particular.
DTIC
Biological Weapons; Deoxyribonucleic Acid; Infectious Diseases; Signatures

20050195989 Georgetown Univ., Washington, DC USA
Genetic Risk Factor for Prostate Cancer
Gelmann, Edward P.; Jan. 2005; 17 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0056
Report No.(s): AD-A434784; No Copyright; Avail: CASI; A03, Hardcopy

NKX3.1 is a homeoprotein with prostate-specific expression in adults. Loss of NKX3.1 correlates with prostate cancer progression. NKX3.1 protein expression is reduced to varying degrees in virtually all primary prostate cancers. The NKX3.1 gene is affected by deletion and/or promoter hypermethylation in 90% of primary prostate cancers. NKX3.1 acts as a transcription factor by binding directly to DNA. NKX3.1 also complexes and coactivates other transcription factors such as serum response factor. We have now found that NKX3.1 complexes with the DNA unwinding enzyme topoisomerase I.

NKX3.1 binds to topoisomerase I in a stoichiometric relationship and enhances scissile strand DNA cleavage by topoisomerase I. NKX3.1 does not affect religation of relaxed DNA by topoisomerase I. We also found that NKX3.1 mediates DNA damage repair after cells are exposed to gamma-irradiation. The effect on DNA repair is mediated in cooperation with topoisomerase I. Loss of NKX3.1 expression that occurs early in prostate cancer may predispose to DNA damage and thereby facilitate prostate cancer progression.
DTIC
Cancer; Genetics; Prostate Gland; Risk

20050195990 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Family History of Breast Cancer as a Determinant of the Risk of Developing Endometrial and Ovarian Cancers: A Nationwide Cohort Study
Kazerouni, N. N.; Jan. 2002; 195 pp.; In English
Report No.(s): AD-A434785; No Copyright; Avail: Defense Technical Information Center (DTIC)
Statement of the problem: Although endometrial and ovarian cancers share some of the same reproductive, hormonal, and genetic risk factors with breast cancer, it is not well established if a family history of breast cancer is associated with endometrial and ovarian cancer risk in a general population setting. We examined these associations in a prospective cohort study.
DTIC
Breast; Cancer; Mammary Glands; Risk

20050195991 House Ear Inst., Los Angeles, CA USA
Neurofibromatosis Type 2 (NF2) Natural History Consortium
Slattery, William H., III; Jan. 2005; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0710
Report No.(s): AD-A434786; No Copyright; Avail: CASI; A03, Hardcopy
Neurofibromatosis 2 (NF2) is an autosomal disorder characterized by the development of multiple tumors within the brain and spinal canal. The purpose of the study is to define the growth rates and clinical course of tumors associated with NF2-affected individuals. An International consortium of clinical centers and expertise in NF2 will be developed, further expanding the infrastructure developed in the 'Natural History of Vestibular Schwannomas in NF2' US Army grant. We will standardize the volumetric analysis of intracranial and spinal tumors, assess the patients' audiological, neurological, and ophthalmological functioning, and analyze molecular and clinical features of the disease over the course of 4 years.
DTIC
Nervous System; Organizations

20050195993 City of Hope Medical Center, Duarte, CA USA
Examining the Role of Mah2 and Mrell in Telomere Rescue
Meyer, Damon; Apr. 2005; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0407
Report No.(s): AD-A434791; No Copyright; Avail: CASI; A03, Hardcopy
Interestingly, about 155 of human cancers have an inactive telomerase gene, leading to the discovery of telomerase-independent mechanisms for regaining telomeric sequences by homologous recombination referred to as alternative lengthening of telomeres(ALT). In S. cerevisiae, there are two ALT pathways controlled by Rad51 and Mre11/Rad50/Xrs2(MRX). The ALT pathway used in humans generates telomeres that resemble the MRX-dependent survivors found in yeast. Recent evidence suggests that the mismatch repair pathway, which is thought to block recombination between mismatched telomeric sequences, limits ALT, perhaps by opposing MRX-dependent ALT. I propose to examine the role of Msh2, the central mismatch repair protein, in restricting ALT in S. cerevisiae. Particular attention will be paid to whether Rad51 or MRX pathway recombinations predominate in these strains, suggesting that mismatch repair selectively restricts one pathway or the other. In addition, the role of Mre11 in ALT will be studied by determining the effect of mutations in specific functional domains of Mre11 in telomerase-independent telomere rescue. This may help determine the relationship between MRX-dependent ALT and specific homologus recombination mechanisms.
DTIC
Homogeneity; Rescue Operations; Telemedicine; Telomeres

20050195994 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Estimating Selected Disease and Non-Battle Injury Echelon I and Echelon II Outpatient Visits of U.S. Soldiers and Marines in an Operational Setting from Corresponding Echelon III (Hospitalization) Admissions in the Same Theater of Operation
Kilian, Dennis B.; Jun. 2000; 69 pp.; In English
Report No.(s): AD-A434792; No Copyright; Avail: CASI; A04, Hardcopy

Non-hospitalized morbidity amongst deployed military forces can have adverse affects on military operations. This has been demonstrated throughout history from Napoleon's typhus outbreak in the retreat from Moscow, to Merrill's Maraders' dysentery outbreak in Burma, and to the US Forces-Somalia dengue and malaria outbreak. Military medical planners do not have references to estimate the amount of Disease and Non-Battle Injury (DNBI) 'walking wounded'. These walking wounded troops are personnel who have some level of morbidity, making them have less than an optimum level of health. This decrement in their optimum level of health may impact on their individual and collective ability to accomplish their military mission. These troops are not hospital admissions, rather, they receive health care from an Echelon I or II health care facility, if at all.

DTIC

Diseases; Estimating; Injuries; Medical Services; Military Operations

20050195995 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Toward Development of an Oral, Plant-Based Vaccine Against Escherichia coli O157:H7
Judge, Nicole A.; Jan. 2004; 179 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434793; No Copyright; Avail: Defense Technical Information Center (DTIC)

Enterohemorrhagic Escherichia coli (EHEC) O157:H7 is the most common infectious cause of bloody diarrhea in the USA, and a sequela of this infection, the hemolytic uremic syndrome (HUS), is the primary cause of acute renal failure in children in the U.S. The majority of U.S. cases of EHEC O157:H7 have occurred as a consequence of ingestion of undercooked, contaminated hamburger or produce and/or water contaminated with bovine manure. Intimin is the primary adhesin of EHEC O157:H7, and is required for colonization of neonatal calves. I hypothesized that an intimin-based vaccination strategy in calves might reduce colonization of cattle with EHEC O157:H7. To test this concept in a small animal model, I developed transgenic tobacco plant cells that expressed the full length or carboxy-terminal portion (Int261) of EHEC O157:H7 intimin and then immunized mice parenterally with intimin expressed from the plant cells, or fed mice the transgenic plant cells, or both. I was able to show that these mice not only generated an intimin-specific mucosal immune response when primed parenterally and boosted orally but also exhibited a reduced duration of EHEC O157:H7 fecal shedding after challenge. These results suggest that transgenic plants are attractive and feasible production and delivery systems for an intimin-based vaccine for cattle, and such a vaccine can reduce the duration of EHEC O157:H7 shedding in a small animal model. In addition, Shiga toxin type 2 (Stx2) is another important EHEC O157:H7 virulence factor that plays a critical role in the development of potentially fatal HUS in humans. I developed a toxoid of Stx2 by making site-directed changes to the nucleotide sequence of the Stx2 A subunit gene that abrogated cytotoxcity in vitro and in vivo. The Stx2 toxoid elicited toxin-neutralizing antibody when parenterally injected in mice.

DTIC

Escherichia; Vaccines

20050195996 Baylor Coll. of Medicine, Houston, TX USA
P190-B, a Novel RhoGAP, in Mammary Gland Development and Breast Cancer Progression
Vargo-Gogola, Tracy; Sep. 2004; 20 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0325
Report No.(s): AD-A434797; No Copyright; Avail: CASI; A03, Hardcopy

In our laboratory we investigate genes and signaling pathways that are critical for mammary gland development and function with the ultimate goal of understanding how these key pathways may be disrupted during breast cancer progression. P190B RhoGAP was identified as a gene that is preferentially expressed in the terminal end buds of the developing mammary gland. Previously we reported that loss of p190B function completely prevents ductal outgrowth in the mammary gland. This result suggests that regulated signaling of the Rho pathway downstream of p190B is essential for proper development of the mammary gland. The studies outlined in this proposal are aimed at further elucidating the role of p190B and the Rho signaling pathway in all stages of mammary gland development and the molecular mechanisms through which p190B acts to influence the different developmental stages in the mammary gland. The role of p190B and the Rho signaling pathway in breast cancer

progression will also be investigated using a well-established mouse model of breast cancer, the MMTV-ErbB2 line of mice.
DTIC
Breast; Cancer; Genes; Mammary Glands

20050195997 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
The Operational Preparedness of USA Air Force Certified Registered Nurse Anesthetists to Provide Trauma Anesthesia
Frank, Michael W.; Oct. 1999; 55 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434798; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of military medicine is to care for the injured during wartime. Military Certified Registered Nurse Anesthetists (CRNAs) must expand their role while deployed and be skilled in the management of trauma. Treating traumatically injured patients in Air Force hospitals is limited while working outside of the operational theater. The trauma anesthesia experience of USA Air Force (USAF) CRNAs is presently unknown. The purpose of this study was to determine the experience and training in trauma anesthesia of CRNAs in the USA Air Force, as well as their perceived value of this experience and training. For this study, a fifteen-question survey tool was developed and then reviewed by two CRNA experts for validity. IRB approval was obtained from both the Uniformed Services University of the Health Sciences and the USAF. Active duty CRNAs (N=269) were surveyed by mail about their length of time as a CRNA, the size of medical facility, the frequency of trauma cases, deployment experience to either combat or humanitarian missions, and trauma care experience outside of their military practice or during anesthesia education. The response rate was 60% (163/269). Data were analyzed using the Statistical Package for Social Services to describe the average trauma anesthesia experience of USAF CRNAs. The results showed that most USAF CRNAs have less than five years experience (109/163), and only 22% (37/163) have been deployed. Inadequate training with field anesthesia equipment was reported by 43% (16/37) of those who had been deployed. Twenty-five percent of the respondents practice trauma anesthesia in their military hospital with most doing less than 3 trauma cases per month. Twenty-two percent practice trauma anesthesia outside the military. This study found that CRNAs in the USAF highly value anesthesia experience in trauma centers, and ATLS courses.
DTIC
Anesthesia; Injuries; United States

20050195999 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Understanding the Regulation of Body Weight: A Focus on Eating Patterns, Energy Intake, and Metabolic Rate
Hughes, Teresa M.; Jan. 2003; 244 pp.; In English
Report No.(s): AD-A434800; No Copyright; Avail: Defense Technical Information Center (DTIC)

The clinically observed eating pattern of gorging (eating fewer, larger meals later in the day) is ill defined in the literature and inconsistently linked to metabolic rate suppression and body composition. The purpose of this study was to further understand the relationship between gorging, metabolic rate, and body composition with a consideration of daily physical activity and purposeful exercise. Gorging was defined as two or fewer meals per day with at least seven hours between waking and the first meal for at least three days per week. It was hypothesized that gorgers would have 1) lower metabolic rates, 2) more body fat, 3) lower energy and higher fat intakes, and 4) more pathological eating attitudes than non-gorgers. Participants were 12 obese gorging (OG), 11 obese non-gorging (ON), 14 normal weight gorging (NG), and 14 normal weight non-gorging (NN; age-matched), non-smoking, otherwise healthy women. Metabolic testing included assessment of resting metabolic rate (RMR), active metabolic rate (AMR) while riding a stationary bicycle at a rate of 50 rpm and workload of 1kg, and dietary induced thermogenesis (DIT) where postprandial metabolic rate was assessed. Results were partially supported. Contrary to the first hypothesis, the eating pattern groups did not differ by RMR $F(1,47) = 3.96$, $p = 0.05$, AMR $F(1, 47) = 2.03$, $p = 0.16$, or DIT $F(1, 47) = 0.40$, $p = 0.53$ after covarying lean body mass. Lean body mass was the best predictor of metabolic rate accounting for 72% of the variance. These findings are limited by the small effect sizes for these analyses.
DTIC
Body Weight; Eating; Food Intake; Metabolism

20050196000 Mayo Clinic, Rochester, MN USA
Functional Characterization of a Novel Pro-Apoptotic Transcriptional Regulatory Protein in Ovarian Cancer
Shridhar, Viji; Jan. 2005; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0085
Report No.(s): AD-A434802; No Copyright; Avail: Defense Technical Information Center (DTIC)

In an effort to identify genetic changes involved in ovarian cancer(OvCa) development, we performed differential

display-PCR, cDNA microarray and suppression subtraction hybridization analyses (SHH) to identify early genetic alterations associated with OvCa. These studies resulted in identification of several genes differentially expressed in OvCa, including a novel gene encoding a transcription elongation-like protein with the ability to induce apoptosis and suppress cancer cell growth. We named the protein ProApoptotic Protein on chromosome X (PAPX). Pro-apoptotic protein on X (PAPX) is a novel nuclear protein with sequence homology to transcription elongation factor like I(TCEAL1) 1/ PAPX induces cell death and attenuates cell growth. We therefore proposed to study the functional role of PAPX as a candidate tumor suppressor in ovarian cancer. We proposed to (1) determine effect of PAPX on tumor and cell growth in vivo and in vitro; (2) analyze gene regulated by PAPX by transcriptional profiling using microarray chips; and (3) identify proteins that interact with PAPX and elucidate the function of PAPX related to tumor suppression.
DTIC
Apoptosis; Cancer; Ovaries; Proteins

20050196001 Roswell Park Memorial Inst., Buffalo, NY USA
Role of Proinflammatory Cytokines in Thermal Activation of Lymphocyte Recruitment in Breast Tumor Microvessels
Chen, Qing; Mar. 2005; 125 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0354
Report No.(s): AD-A434803; No Copyright; Avail: CASI; A06, Hardcopy

A major challenge is to develop approaches to target delivery of tumor-specific immune effector cells to tumor tissues. Immune cells are frequently excluded from the intratumoral region of primary tumors including breast cancer. Thus, these cells cannot initiate contact-dependent lysis of tumor targets. We have reported that poor infiltration of tumor tissues in murine models correlates with limited expression of critical gatekeeper adhesion molecules (e. g., intercellular adhesion molecule-1, ICAM-1) which control egress of blood-borne lymphocytes into tissues. Our studies demonstrate that fever-range thermal therapy upregulates ICAM-1 expression on intratumoral vessels in transplantable murine breast tumors and other tumor models. ICAM-1 upregulation occurs principally on CD31+ vessels of tumor and lymphoid tissues, but not in extralymphoid organs. Thermal induction of ICAM-1 correlates with enhanced CD8+ T cell adhesion, homing and infiltration in tumor tissues. Neutralization of selected inflammatory cytokines (IL-6, but not TNF-alpha or IL-1beta) suppresses thermal induction of ICAM-1 on vessels. Soluble gp130 also prevented ICAM-1 induction, indicating that thermal activities in vascular targets are dependent on an IL-6 trans-signaling mechanism. These results support the hypothesis that IL-6 dependent signaling mechanisms overcome the microvascular barrier to tumor immunity through stimulation of heightened trafficking of lymphocyte subsets to tumor sites.
DTIC
Breast; Cancer; Lymphocytes; Mammary Glands; Tumors

20050196002 Chicago Univ., Chicago, IL USA
A Method for Simulating Mammograms
Nishikawa, Robert M.; Aug. 2004; 96 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9122
Report No.(s): AD-A434805; No Copyright; Avail: CASI; A05, Hardcopy

This project is to facilitate research in digital mammography and related technologies, in particular computer-aided diagnosis (CAD) and image processing. A major limitation to the rapid development and subsequent clinical implementation of these technologies is the lack of a standardized set of mammorgrams with absolute truth (e.g., exact location and extend of a cancer) to be used in development and evaluation. We are developing a method to produce computer-simulated mammograms. The approach is to model the creation of the mammogram on the computer -- all steps from x rays exiting the breast to the image being displayed on a light box. The basic model, which we have developed previously, has been improved and is combined with accurate information of the appearance of normal breast anatomy and of benign and malignant breast lesions. These are obtained from high quality images of cadawer breasts and biopsy specimens. our approach is similar to that of Van Metter et al. who modeled chest radiographs Van Metter 1986!. We believe that this technique can produce simulated mammograms that appear to be actual mammograms. This hypothesis is being tested by performing quantitative comparisons of simulated and real mammograms.
DTIC
Breast; Cancer; Computer Techniques; Diagnosis; Mammary Glands; Simulation

20050196003 New York Univ., New York, NY USA

99-Technetium Sestamibi Scanning to Predict the Efficacy of Estramustine Phosphate in Overcoming Paclitaxel Resistance in Patients with Advanced Breast Cancer

Volm, Matthew D.; Sep. 2004; 6 pp.; In English

Contract(s)/Grant(s): DAMD170-99-1-9326

Report No.(s): AD-A434806; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of this research was to investigate the ability of 99-Technetium Sestamibi (Tc-99-SM) to serve as a non-invasive means of assessing the presence of clinically relevant drug resistance in patients with advanced breast cancer. Tc-99-SM is a substrate of the p-glycoprotein, the transmembrane drug efflux transporter involved in classic multi-drug resistance (MDR). We proposed to the hypothesis that rapid clearance of Tc-99-SM correlates with the presence of functional MDR and can be used to predict which patients will have tumors resistant to chemotherapy drugs that are MDR substrates. We also proposed investigating whether changes in the tumor clearance of 99-Tc-SM observed before and after the administration of an MDR inhibitor, could predict whether the inhibitor can overcome clinical drug resistance in an individual patient.

DTIC

Breast; Cancer; Chemotherapy; Drugs; Mammary Glands; Patients; Phosphates; Proteins; Technetium

20050196004 Agency for Healthcare Research and Quality, Rockville, MD USA

Standardizing Ambulatory Care Procedures in a Public Hospital System to Improve Patient Safety

Kleinpeter, Myra A.; Jan. 2005; 13 pp.; In English

Report No.(s): AD-A434807; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Medical Center of Louisiana at New Orleans (MCLNO) provides care to primarily indigent and medically underserved patients in Louisiana. The hospital and ambulatory clinics serve as a clinical laboratory for students from schools of medicine, pharmacy, and nursing, and allied health programs. In response to a potential threat to patient safety, an initial review of the dental procedures performed at MCLNO was done, and then a review of all procedures approved for the medical staff credentialing process was performed. The initial findings revealed a lack of standardization of patient flow and process for ambulatory procedures, disparities in perioperative evaluations, inadequate nursing care in the immediate postoperative period, and problems in the environments for performing procedures. A multidisciplinary team was assembled to review all procedures and develop standardized processes to improve patient safety for ambulatory procedures. To determine the appropriate level of care for patients, perioperative evaluations, monitoring and followup, nursing practice standards, clinical practice guidelines, and Medicare ambulatory procedure codes were reviewed. Following review, recommendations were adopted by the Medical Staff's Credentials Committee to update the standard credentials for each department and to grant additional privileges for credentialed members of the medical staff based on training, competencies, and experience.

DTIC

Clinical Medicine; Health; Hospitals; Medical Services; Patients; Safety; Standardization

20050196006 Agency for Healthcare Research and Quality, Rockville, MD USA

SimCare: A Model for Studying Physician Decisionmaking Activity

Dutta, Pradumna; Biltz, George R.; Johnson, Paul E.; Sperl-Hillen, JoAnn M.; Rush, William A.; Duncan, Jane E.; O'Connor, Patrick J.; Jan. 2005; 15 pp.; In English

Contract(s)/Grant(s): R01-HS10639-01A1

Report No.(s): AD-A434809; No Copyright; Avail: Defense Technical Information Center (DTIC)

A major factor that contributes to the high rates of medical error in the treatment of patients with diabetes and other chronic diseases is the complexity of the tasks that physicians must complete. SimCare is a model of the clinical care setting for patients with type 2 diabetes. The model was designed to support investigation of physician cognition and decisionmaking activity. SimCare is dynamic and interactive and simulates diabetes management in the office-practice setting. SimCare presents a series of cases based on clinical situations representing task features that are thought to be the source of both realistic care decisions and medical errors. Once a simulated clinical case is initiated, physicians select treatment options (termed 'moves') from an unguided set of choices similar to those available in routine office practice. The cumulative record of the chosen treatment moves is available for analysis and comparison with an expert's sequence of moves for each simulated patient. SimCare is potentially both an assessment and a teaching tool that enables the observation and analysis of decisionmaking in the simulated practice setting. This paper discusses the use of this tool to identify potential sources of

medical errors and guide customized learning interventions designed to reduce them.
DTIC
Clinical Medicine; Decision Making; Errors; Medical Services; Patients; Physicians

20050196007 South Carolina Univ., Columbia, SC USA
Phase I Induction and Estrogen Metabolism in Women with and without Breast Cancer and in Response to a Dietary Intervention
Hebert, James R.; Oct. 2004; 17 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9279
Report No.(s): AD-A434810; No Copyright; Avail: CASI; A03, Hardcopy

Work by our group and others provide the scientific basis of this study (1-11). Cross-national studies of breast cancer rates and studies of migrants indicate that environmental factors are responsible for large population-level differences in breast cancer rates and rates of change over time. In a study of 46 countries, we found that over 90% of breast cancer mortality could be accounted for mainly by dietary factors (12). On a per-calorie basis, the strongest effect in the data was the protective effect of cabbage. There is some evidence that vegetables in the Brassica genus, like cabbage and broccoli, modify estrogen metabolism by causing 17Beta-Estradiol (E2) to be metabolized to 2-hydroxyestrone (2HE) rather than 16alpha-hydroxyestrone (16HE). Relative to 2HE,16HE appears more likely to cause cancer and breast cancer patients have a lower ratio of these metabolites than do disease-free controls.
DTIC
Breast; Cancer; Diets; Estrogens; Females; Mammary Glands; Metabolism

20050196008 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Effects of AZT, ddC, and d4T on Memory in Male and Female Rats
Skvorc, Casey; Jan. 1998; 66 pp.; In English
Report No.(s): AD-A434811; No Copyright; Avail: CASI; A04, Hardcopy

Some anti-HIV medications exert behavioral and neurotoxic side effects that deleteriously affect quality of life. The present research examined the effects of three anti-HIV medications -- AZT, ddC, dd4T - on memory in Sprague-Dawley male and female rats. Memory was chosen as the dependent variable because it is an important psychological construct, its profound effects on quality of life, and its relationship to medication compliance. Three experiments used retention of the active evidence shuttlebox performance as an index of memory. Experiment 1 (N-60) found that males closed with medication performed significant slower (i.e. demonstrating impaired memory function) than females. Females dosed with AZT or ddC performed significantly faster on the second day, compared to the first day, of testing.
DTIC
Females; Males; Rats

20050196009 Agency for Healthcare Research and Quality, Rockville, MD USA
Standardized Simulated Events for Provocative Testing of Medical Care System Rescue Capabilities
Blike, George; Cravero, Joseph; Andeweg, Steve; Jensen, Jens; Christoffersen, Klaus; Jan. 2005; 16 pp.; In English
Contract(s)/Grant(s): RO3-HD041229-01
Report No.(s): AD-A434812; No Copyright; Avail: Defense Technical Information Center (DTIC)

Human errors that result in rare critical events during the course of routine medical care are especially difficult to study. Although the incidence of severe respiratory depression with routine sedation is small, millions of patients receive this care annually, putting hundreds or thousands of persons at risk. Elimination of sedation errors is particularly important since associated deaths and neurological injuries are virtually 100 percent avoidable.
DTIC
Errors; Health; Patients; Rescue Operations; Standardization

20050196010 LifeCell Corp., Branchburg, NJ USA
Non-Immunogenic Structurally and Biologically Intact Tissue Matrix Grafts for the Immediate Repair of Ballistic-Induced Vascular and Nerve Tissue Injury in Combat
Bachrach, Nathanial; Dec. 2004; 74 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0177
Report No.(s): AD-A434813; No Copyright; Avail: CASI; A04, Hardcopy

In the first two years of this work the production of decellularized and freeze-dried vascular grafts from human umbilical vessels was accomplished while substantially maintaining tissue microstructure biological activity and biomechanical properties. It was anticipated that umbilical vein and artery grafts implanted clinically would demonstrate patency as well as significant repopulation and remodeling by the surrounding host tissue. Such a graft would be a desirable alternative to current interventions for hemodialysis access; occluding non-remodeling synthetic PTFE grafts and inconsistent native fistulas, below-the-knee vessel replacement; amputation, and coronary artery bypass grafting.
DTIC
Cardiovascular System; Casualties; Combat; Grafting; Injuries; Nerves; Skin Grafts; Warfare

20050196011 Washington Univ., Saint Louis, MO USA
Chromatin Structure and Breast Cancer Radiosensitivity
Pandita, Tej K.; Oct. 2004; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0356
Report No.(s): AD-A434814; No Copyright; Avail: CASI; A02, Hardcopy
Most patients with breast cancer tolerate radiotherapy well with only limited acute, reversible adverse effects. However, about 5% of patients experience severe, delayed complications such as skin pigmentation changes, subcutaneous fibrosis, rib fractures, cardiac disease, pulmonary fibrosis, second primary cancer (specifically esophageal squamous-cell carcinoma as well as adenocarcinoma) and other complications, which manifest several years after treatment with ionizing radiation. Epidemiological studies have shown that irradiation of the breast especially among young women, increases the risk for subsequently developing breast cancer. It might thus be expected that genes that are known to influence radiation sensitivity may be associated with the radiotherapy related adverse effects.
DTIC
Breast; Cancer; Chromatin; Mammary Glands; Proteins; Radiation Tolerance

20050196012 California Univ., San Francisco, CA USA
Shunting Proliferation Signals to Apoptotic Pathways for Treatment of Breast Cancer
Park, Sang-Hun; Jul. 2004; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0528
Report No.(s): AD-A434816; No Copyright; Avail: CASI; A03, Hardcopy
Cells have the remarkable ability of detecting specific external stimuli and translating them into growth, differentiation or death. These responses are mediated by signal transduction pathways such as mitogen-activated protein(MAP) kinase pathways conserved from yeast to man. Because of their roles in regulating cell growth, differentiation and death, improper activation of MAP kinase pathways has implicated in breast cancer and other proliferative diseases. The flow of intracellular signaling information is mediated by a series of protein-protein interactions that often take place on scaffold proteins. Scaffold proteins are postulated to tether together a set of pathway proteins and help them act on each other. The flow of signaling information can be artificially modulated to create a novel input-output relationship by engineering scaffold proteins which recruit a unique set of signaling proteins. This strategy of pathway engineering provides for a novel means to treat diseases caused by signaling defects. The progress of breast cancer is determined by a precise balance between growth signaling and death signaling inside cell. One way to treat breast cancer could be the suppression of growth signaling, the promotion of death signaling or both in cancer cells. Goal in this study is to shunt the growth signal to cell death in breast tumor cells and to study in detail the regulatory mechanisms of MAP kinase signaling by identifying negative regulators.
DTIC
Apoptosis; Breast; Cancer; Mammary Glands; Mitosis

20050196013 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Effects of Nicotine and Nicotinic Antagonists on the Acoustic Startle Response and on Pre-Pulse Inhibition in Rats
Popke, Eric J.; Jan. 1996; 55 pp.; In English
Report No.(s): AD-A434818; No Copyright; Avail: Defense Technical Information Center (DTIC)
In rats, nicotine has effects on the amplitude of the acoustic startle response (ASR) and on pre-pulse inhibition of the acoustic startle response (PPI) that are consistent with an inverted U-shaped dose-effect. Because ASR and PPI have been used to study processes that underlie attention and sensory gating, these effects of nicotine in rats are viewed as consistent with reports that nicotine can enhance attention in human smokers. However, the mechanisms underlying these affects of nicotine have not been identified. The purpose of the present experiment was to determine whether nicotine's affects on ASR and PPI

are a result of its effects in the central nervous system or if nicotine's effects on ASR and PPI are due to its effects peripherally.
DTIC
Evoked Response (Psychophysiology); Nicotine; Nicotinic Acid; Physiological Effects; Rats

20050196014 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
The Effects of Low Density Lipoproteins in Endothelial Mediated Vasoactivity in the Coronary Circulation in Swine
Crago, Mark; Mar. 1998; 94 pp.; In English
Report No.(s): AD-A434819; No Copyright; Avail: CASI; A05, Hardcopy

Hypercholesterolemia, which includes high concentrations of low density / lipoproteins (LDL), alters normal endothelial functions in patients with atherosclerosis. The aim of this study was to investigate the effects of low density lipoproteins on endothelial mediated changes in coronary blood flow and coronary vascular resistance in hypercholesterolemic swine. Animals were assigned at random into three groups (n=5/group).
DTIC
Cardiovascular System; Coronary Circulation; Lipoproteins; Swine

20050196016 Valley Hospital, Ridgewood, NJ USA
Medical Errors Reduction Initiative
Mutter, Michael L.; May 2005; 9 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0536
Report No.(s): AD-A434822; No Copyright; Avail: CASI; A02, Hardcopy

The Valley Hospital of Ridgewood, New Jersey, is proposing to extend a limited but highly successful specimen management and medication administration medical errors reduction initiative on a hospital-wide basis. The program designed to reduce specimen collection errors at The Valley Hospital is rooted in utilization of bar-code technology in tandem with the use of handheld personal data terminals to create a positive identification system at the point of care. The system is currently implemented in five patient care units and working with great success to minimize error.
DTIC
Coding; Errors; Management Systems; Medical Services; Patients

20050196021 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Effects of Nicotine Administration, Cessation, and Differential Housing Conditions on Aggressive Behaviors of Male and Female Rats
Scheufele, Peter M.; Jan. 1997; 90 pp.; In English
Report No.(s): AD-A434827; No Copyright; Avail: CASI; A05, Hardcopy

The present experiment examined effects of nicotine administration, nicotine cessation, and two housing conditions (individuals vs. grouped) on social interaction and serum testosterone in Long-Evans rats. Nicotine reduced aggressive behavior of male and female rates, particularly in single-house conditions. Effects of f nicotine on serum testosterone in males also depended on housing condition with nicotine reducing serum testosterone of single-housed males but not group-housed males. In addition, single-housed males and females exhibited more aggressive behaviors than group-housed animals. Male testosterone levels and aggressive behaviors returned to baseline during nicotine cessation. The results suggest that effects of nicotine may be modified by environmental or social situations. Further, for male subjects, aggressive behavior were accounted for by housing and drug conditions rather than by testosterone levels.
DTIC
Females; Males; Nicotine; Physiological Effects; Rats

20050196023 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Cyclopentadienyl Rhenium (Technetium) Tricarbonyl Complexes Integrated in Estrogen Receptor Ligands for ER+ Tumor Imaging
Ackroyd, Nathan C.; Katzenellenbogen, John A.; Oct. 2004; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0681
Report No.(s): AD-A434829; No Copyright; Avail: CASI; A02, Hardcopy

A class of breast tumors, known as ER+, contains significant concentrations of ER which functions to regulate cell growth, and mediate the action of estrogen antagonists. There is a need for the development non-invasive and reliable methods for the determination of tumor ER concentration in the identification of patients predicted to respond to hormone therapy. It has been

shown that tumor ER concentration can be determined by imaging, using 18F-labeled ER selective ligands, and that the ER concentrations determined by imaging correlate well with those determined by immunoassay methods on surgical biopsies. DTIC

Breast; Cancer; Estrogens; Imaging Techniques; Ligands; Mammary Glands; Neoplasms; Rhenium; Technetium; Tumors

20050196024 Air Force Research Lab., Brooks AFB, TX USA

Operational Risk Management of Fatigue Effects

Miller, James C.; May 2005; 33 pp.; In English

Contract(s)/Grant(s): Proj-7757

Report No.(s): AD-A434836; AFRL-HE-BR-TR-2005-0073; No Copyright; Avail: CASI; A03, Hardcopy

This document describes the authors' first attempt to use a quantitative, applied model of fatigue and well-accepted fatigue countermeasures in the context of operational risk management. To identify fatigue hazards, they listed the known, primary physiological and psychological effects of fatigue. These effects were aligned approximately with the cognitive and physiological tests shown to be sensitive to the fatigued state. The extrapolation of the listed effects to safety-sensitive jobs was explained through examples. Each effect had the potential to cause harm in military operations and, thus, was a hazard. To assess fatigue risks, they used the applied model of fatigue, SAFTE, to quantify the risks associated with five types of fatigue: physical fatigue, circadian effects, acute fatigue, cumulative fatigue, and chronic fatigue. In terms of fatigue control measures, the best fatigue countermeasure is sleep, which is the only countermeasure that provides recovery. It also reduces the probability that fatigue will have an effect on mission safety and, concomitantly, reduces the exposure to fatigue. When adequate sleep cannot be used to counter fatigue, then one must consider the use of 'Go' and 'No-Go' adjuncts, including schedule adjustments and pharmacological adjuncts. These adjuncts serve to reduce the severity of fatigue effects or the exposure to fatigue-related risk. All controls except sleep should be viewed as 'band-aid' approaches, to be used as a last resort when other controls are insufficient and the mission must be accomplished. Recovery sleep will still be necessary after the other controls have been applied to accomplish the mission.

DTIC

Physiological Effects; Risk; Therapy

20050196025 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA

The Effects of Stress and Nicotine on Heart Histopathology Differ in Male and Female Sprague-Dawley and Long-Evans Rats

Elliott, Brenda M.; Jan. 2001; 82 pp.; In English

Report No.(s): AD-A434837; No Copyright; Avail: CASI; A05, Hardcopy

This experiment investigated the effects of nicotine for 14 days (0, 6, or 12 mg/kg/day) and immobilization stress on heart histopathology in 120 male and 120 female rats of two strains: Sprague-Dawley and Long-Evans. Results show that both nicotine and stress affected heart tissue, including heart mass and wall thickness. These effects differed between males and females. Females were more sensitive than males to the effects of nicotine on heart histopathology. In contrast, males were more sensitive than females to the effects of stress. The effects of nicotine also differed between the Sprague-Dawley and Long-Evans rats. The hearts of the Long-Evans rats were more affected by both nicotine and stress than were the Sprague-Dawley rats. These findings have important implications for understanding the cardiotoxic effects of both nicotine and stress and could be used to further elucidate the mechanisms by which stress and nicotine separately contribute to heart disease.

DTIC

Females; Heart; Histology; Males; Nicotine; Pathology; Physiological Effects; Rats

20050196026 Mount Sinai School of Medicine, New York, NY USA

Immune Surveillance, Cytokines, and Breast Cancer Risk: Genetic and Psychological Influences in African American Women

Bovbjerg, Dana H.; Aug. 2004; 6 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0501

Report No.(s): AD-A434838; No Copyright; Avail: CASI; A02, Hardcopy

Breast cancer cells are known to bear determinants that would allow tumor-specific immune responses. However, initiation and amplification of such immune responses are critically dependent upon the balance in TH1 and TH2 cytokine profiles. This molecular epidemiological study evaluates the impact that variability in cytokine profiles (inferred from

functional polymorphisms in cytokine genes) may have on breast cancer risk among urban African American women. In the first phase of the study, DNA collected and approved for additional study as part of a previously funded case-control investigation (n=1600) will be assessed for cytokine polymorphisms. Because cytokine profiles are also known to be affected by environmental factors, particularly levels of stress, this study also evaluates the relative contribution of genotype and stress influences using data collected for that purpose from a sub-sample of healthy controls (n=400) recruited from the graduates of the larger study. Results will allow evaluation of the possibility that deficits in cytokine responses due to genetic or environmental factors may contribute to breast cancer risk. Based on these findings, women at risk for breast cancer because of polymorphisms in genes important for effective immune surveillance could be targeted for innovative prevention strategies, including stress reduction and immune modulators.
DTIC
Africa; Breast; Cancer; Females; Genes; Genetics; Mammary Glands; Risk; Surveillance

20050196027 Drexel Univ., Philadelphia, PA USA
An Integrated Civilian Medical Response to Mass Casualty Incidents
Onaral, Banu; May 2005; 44 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0419
Report No.(s): AD-A434839; No Copyright; Avail: CASI; A03, Hardcopy

U.S. military and civilian populations have much to accomplish in the effort to enhance preparedness for potential mass casualty incidents. In this effort, CIMERC has partnered with many regional, national, governmental, and nongovernmental organizations. The proposed projects will benefit from the comprehensive network and the proven success of the respective institutions in integrating diverse interests and expertise into a large-scale biodefense initiative. Command and control projects on imaging include developing a virtual whiteboard hardware and software system, creating aerial robot platforms equipped with wireless cameras, acquiring and distributing processed images to wired and wireless hardware, and deploying sensor networks for casualty localization. Biodefense, assessment, implementation, and evaluation will be enhanced by means of algorithm development for predictive systems that can automatically identify developing scenarios and alert relevant personnel at critical moments. These projects include non-thermal plasma sterilization using dielectric barrier discharge and magnetic gliding arc devices to sterilize air contaminated with bioaerosols, development of a numerical model to address anthrax spore release in an apartment complex and subsequent disinfection, use of near-infrared (NIR) diffuse optical tomography to evaluate skin burn damage, and use of predictive syndromic surveillance in medical facilities. Readiness and response training will be enhanced to further prepare the nation's emergency response workforce. These projects include the development of a Rural Response Network test bed for rural medical preparedness and the establishment of the Mass Casualty Incident Education Forum. The latter answers the need for a web-based educational system that interfaces with existing training modalities and facilitates learning and assessment throughout response communities.
DTIC
Casualties; Communication Networks; Emergencies; Management Methods; Medical Services

20050196028 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Psychiatry in the U.S. Army: Lessons for Community Psychiatry
Glass, Albert J.; Jones, Franklin D.; Jan. 2005; 271 pp.; In English
Report No.(s): AD-A434841; No Copyright; Avail: Defense Technical Information Center (DTIC)

This volume is a companion book to 'Neuropsychiatry in the World War' (World War I, 1929); 'Neuropsychiatry in World War II, Volume I, Zone of the Interior,' (1966); and 'Neuropsychiatry in World War II, Volume II, Overseas Theaters,' (1973). The previous volumes of this series focused almost exclusively upon the establishment and operation of neuropsychiatric services under wartime conditions. In contrast, the present volume deals with significant events of Army psychiatry in peace and war since the end of World War II. Following an overview of the beginnings of military psychiatry in Chapter 1, Chapters 2-4 cover the evolution of military psychiatry up to 1950. These chapters focus on Army psychiatry and neurology during the Civil War; Army psychiatry in the post-Civil War era (1866-1914), including the health of the Army during this period and during the Spanish American War, Philippine Insurrection, and Boxer Rebellion; and Army psychiatry during World Wars I and II. Chapters 5-12 focus on the Korean War in terms of combat phases and psychiatric response. These chapters examine the background to the Korean War; the North Korean Invasion of Jun-Sep 1950; the United Nations (UN) Offensive of Sep-Nov 1950, including psychiatric casualties, shock therapy, and Japanese B encephalitis; the Chinese Communist Offensive of Nov 1950-Jan 1951; the UN winter Offensive of Jan-Apr 1951; the Spring Offensives of Apr-Jul 1951; truce negotiations and limited offensives by the UN in Jul-Oct 1951; and military psychiatry after the first year of the Korean War. Chapters 13-16 focus on military psychiatry during the interval between the Korean War and the Vietnam War (1953-1961);

military psychiatry in Vietnam; military psychiatry in selected international conflicts (1967-1993), such as the Arab-Israeli Wars, Afghan War, Iran-Iraq War, U.S. invasions of Grenada and Panama, Persian Gulf War, and Somalia; and the future of military psychiatry.
DTIC
Disorders; Medical Services; Mental Health; Military Operations; Psychiatry

20050196030 Roswell Park Memorial Inst., Buffalo, NY USA
GKLF as a Novel Target in Selenium Chemoprevention of Prostate Cancer
Dong, Yan; Feb. 2005; 11 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0009
Report No.(s): AD-A434843; No Copyright; Avail: CASI; A03, Hardcopy

The present study examined the mechanistic basic for selenium upregulation of the zinc finger transcription factor gut-enriched krueppel-like factor (GKLF) and the effect of GKLF overexpression on the growth of prostate cancer cells. The studies were conducted in the androgen-responsive LNCaP and the androgen-unresponsive, AR-null PC 3 cells. We found that selenium upregulates GKLF transcript through distinct mechanisms in the two cell types: a decrease in mRNA degradation in LNCap and an increase in GKLF transcription in PC-3. Transfection of GKLF in PC-3 cells inhibited DNA synthesis and induced apoptosis. In contrast, LNCaP cells responded to GKLF transfection by increasing the level of androgen receptor (AR), and the effect of which predominated, leading to a modest stimulation of cell growth. We also found that selenium significantly decreases the expression of AR in LNCaP cells. Exogeneous expression of AR greatly attenuated the growth suppressive activity of selenium, although the GKLF level was markedly induced after the transfection. Therefore, compared to the induction of GKLF, the disruption of AR signaling is probably more important for selenium action and more relevant to selenium chemoprevention of prostate cancer, since the vast majority of prostate cancers, including those refractory to hormone therapy, express a functional AR.
DTIC
Cancer; Prostate Gland; Selenium; Targets

20050196031 Cornell Univ., Ithaca, NY USA
The Role of RASGRF1 in Neurofibromatosis - Validating a Potential Therapeutic Target
Soloway, Paul D.; Jun. 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0652
Report No.(s): AD-A434844; No Copyright; Avail: CASI; A02, Hardcopy

It is hypothesized that the gene encoding RASGRF1, a GTP exchange factor (GEF), controls the severity of neurofibromatosis. Over-expression of RASgrf1 is predicted to exacerbate neurofibromatosis while Rasgrf1 silencing will attenuate it. Two novel strains of mice ideally suited to test this hypothesis that were developed in my lab are being used to evaluate the role or Rasgrf1 on the manifestations of neurofibromatosis type 1. One strain of mice over-express Rasgrf1, the other has diminished expression. These were crossed with a mouse model for NF1 and the effects of the altered level of RASGRF1 on tumorigenesis were monitored. The results indicate that over-expression of Rasgrf1 significantly hastens the time of tumor onset and increases the overall frequency of tumor incidence. In contrast, diminished expression modestly delays the timing of tumor development, but overall frequency of tumor development is not changed. To extend this work from the genetic to biochemical, we have established assays to evaluate Ras activation status. The analysis of tumors and tissues from mice is ongoing. To extend this work further from mouse to human, we are establishing the assays to detect human RASGRF1 mRNA from human tumor sections using in situ hybridization.
DTIC
Fibrosis; Neoplasms; Targets; Therapy

20050196033 Rutgers - The State Univ., New Brunswick, NJ USA
Use of Epidermolysis Bullosa Biomarkers in Models of Vesicant Injury
Gerecke, Donald R.; Sabourin, Carol L.; Jun. 2005; 39 pp.; In English
Contract(s)/Grant(s): DAMD17-02-C-0091
Report No.(s): AD-A434846; No Copyright; Avail: CASI; A03, Hardcopy

The chemical warfare agent sulfur mustard (HD) produces a delayed inflammatory response followed by blister formation in skin of exposed individuals. There is a similarity between HD-induced skin injury and the skin disease Epidermolysis Bullosa (EB) in both the morphology of the damage and the structural components involved. Both HD-induced injury and EB

are believed to involve matrix metalloproteinases (MMPs), which play key roles in the disruption of connective tissue proteins and basement membrane proteins. The objectives of this study are to examine HD-induced changes in gene expression of MMP-2, MMP-9, and their substrates (laminin-gamma2, laminin-beta3, and laminin5-alpha3A) in skin from mice cutaneously exposed to HD and to determine the efficacy of specific MMP inhibitors to protect against HD injury.
DTIC
Biomarkers; Diseases; Epidermis; Injuries

20050196035 Maryland Univ., Baltimore, MD USA
Advanced Video Technology for Safe and Efficient Surgical Operating Rooms
Park, Adrian; Mar. 2005; 71 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-2-0001
Report No.(s): AD-A434848; No Copyright; Avail: CASI; A04, Hardcopy

Research Objective 1: Establish an Operating Room of the Future Test Bed with video-assisted coordination tools. Working with clinical and technical staff and consultants, a vision was developed for a video infrastructure. This vision was then translated into performance specifications that were then used to identify and select the hardware and software necessary to support this infrastructure. Implementation was completed in conjunction with the construction of new operating Room suites at the University of Maryland Medical Center. This infrastructure is now operational and has proven valuable as a coordination tool to improve patient safety by improving situational awareness for the OR staff. Research Objective 2: Test the feasibility of the use of a video enhanced white board. As a result of this research, a video-based coordination system, named VideoBoard was developed and deployed in the Operating Room of the Future Test Bed. In addition to creating situational awareness for the clinical staff, the system addresses the issue of patient confidentiality and the need for limiting access to patient specific information.
DTIC
Computer Techniques; Diagnosis; Medical Services; Rooms; Video Signals

20050196038 Rush-Presbyterian-Saint Luke's Medical Center, Chicago, IL USA
Mechanism for Prenatal LPS-Induced DA Neuron Loss
Carvey, Paul M.; Mar. 2005; 46 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-2-0365
Report No.(s): AD-A434851; No Copyright; Avail: CASI; A03, Hardcopy

A small percentage of patients with Parkinson's disease (PD) are caused by genetic defects (familial Parkinson's disease). The etiologies of the majority of patients are still unknown. Recent advance in our laboratories suggests that prenatal exposure to bacterial toxin, lipopolysaccharide (LPS), could be an important etiology for some PD patients. A key finding is that animals exposed to LPS prenatally display fewer than normal number of dopamine (DA) neuron in the midbrain, a hall marker pathology in human patients. The mechanism for such DA neuron loss is not known. The preliminary data suggested that prenatal LPS may interfere DA neuron precursor cells (progenitor cells) migration to substantia nigra or DA neuron process outgrowth and therefore reduce the number of DA neurons in the midbrain. We proposed to use both in vivo and in vitro approaches to investigate these possibilities. A significant progress has been made in the last eleven months. Implementation of this proposal has resulted in three major findings: 1. Prenatal bacterial LPS induce loss of BrdU positive cells in the midbrain. 2. The toxicity of prenatal LPS requires removal of mitotic signal(s) to the dividing progenitor (stem) cells. 3. Prenatal LPS reduced dopamine neuron process total length that prevents dopamine neurones to reach trophic-rich striatal target tissue, a positive mechanism underlying the dopamine neuron loss in the prenatal LPS model.
DTIC
Bacteria; Brain; Diagnosis; Diseases; Dopamine; Etiology; Losses; Molecules; Neurons; Stem Cells; Toxins and Antitoxins

20050196039 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
The Influence of Platelet-Derived Growth Factor and Fibroblast Growth Factor 2 on Oligodendrocyte Development and Remyelination
Murtie, Joshua C.; Jan. 2004; 153 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434853; No Copyright; Avail: Defense Technical Information Center (DTIC)

Multiple sclerosis (MS) is a demyelinating disease of the central nervous system (CNS) characterized by repeated episodes of autoimmune-mediated demyelination. Symptoms of the disease range from loss of vision to paralysis with each episode resulting in a decreased remyelination response. If remyelination does not occur, bare axons will not be able to

function properly either by inefficient saltatory conduction or by degeneration resulting from a lack of myelin. This study examines the effects of growth factors on recovery from demyelination. Specifically, what roles do plateletderived growth factor (PDGF) and fibroblast growth factor 2 (FGF2) play during remyelination of the central nervous system? This question will be addressed using the cuprizone model of demyelination with significant remyelination. The remyelination response in this model will be examined in FGF2 knockout mice as well as PDGF alpha receptor (PDGFαR) heterozygous mice. This study examines the elimination of FGF2 signaling and the reduction of PDGF signaling in an animal model of demyelination with significant remyelination. The current results demonstrate that the predominant role for FGF2 during development and remyelination is that of an inhibitor.
DTIC
Central Nervous System; Diseases; Fibroblasts; Nerve Fibers; Nerves; Nervous System; Platelets; Signs and Symptoms

20050196040 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Conformational Sampling of the Botulinum Neurotoxin Serotype A Light Chain: Implications for Inhibitor Binding
Burnett, James C.; Schmidt, James J.; McGrath, Connor F.; Nguyen, Tam L.; Hermone, Ann R.; Panchal, Rekha G.; Vennerstrom, Jonathan L.; Kodukula, Krishna; Zaharevitz, Daniel W.; Gussio, Rick; Bavari, Sina; Nov. 2004; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434855; No Copyright; Avail: Defense Technical Information Center (DTIC)

Botulinum neurotoxins (BoNTs) are the most potent of the known biological toxins, and consequently are listed as category A biowarfare agents. Currently, the only treatments against BoNTs include preventative antitoxins and long-term supportive care. Consequently, there is an urgent need for therapeutics to counter these enzymes--post exposure. In a previous study, we identified a number of small, nonpeptidic lead inhibitors of BoNT serotype A light chain (BoNT/A LC) metalloprotease activity, and we identified a common pharmacophore for these molecules. In this study, we have focused on how the dynamic movement of amino acid residues in and surrounding the substrate binding cleft of the BoNT/A LC might affect inhibitor binding modes. The X-ray crystal structures of two BoNT/A LCs (PDB refcodes=3BTA and 1E1H) were examined. Results from these analyses indicate that the core structural features of the examined BoNT/A LCs, including alpha-helices and beta-sheets, remained relatively unchanged during 1ns dynamics trajectories. However, conformational flexibility was observed in surface loops bordering the substrate binding clefts in both examined structures. Our analyses indicate that these loops may possess the ability to decrease the solvent accessibility of the substrate binding cleft, while at the same time creating new residue contacts for the inhibitors. Loop movements and conformational/positional analyses of residues within the substrate binding cleft are discussed with respect to BoNT/A LC inhibitor binding and our common pharmacophore for inhibition. The results from these studies may aid in the future identification/development of more potent small molecule inhibitors that take advantage of new binding contacts in the BoNT/A LC.
DTIC
Bacteria; Clostridium Botulinum; Inhibitors; Microorganisms; Sampling; Toxins and Antitoxins

20050196046 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Interferon Alfacon1 is a Potent Inhibitor of SARS-Corona Virus in Cell-Based Models
Paragas, Jason; Blatt, Lawrence M.; Hartmann, Chris; Huggins, John W.; Endy, Tim P.; Jan. 2005; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434863; RPP-04-260; No Copyright; Avail: Defense Technical Information Center (DTIC)

Preliminary data examining interferon alphacon1 treatment of SARS-CoV (severe acute respiratory syndrome-corona virus)-infected patients suggest this therapy is well tolerated and of therapeutic benefit. We report herein that interferon alfacon1, has potent in vitro antiviral activity against SARS-CoV. In a cytopathic effect protection (CPE) assay, interferon alfacon1 inhibited the generation of CPE in a dose-dependent manner with an IC50 of 0.001 g/ml, a clinically achievable level. Furthermore, interferon alphacon1 also demonstrated significant antiviral activity in yield reduction and plaque reduction assays. The in vitro antiviral activity of interferon alphacon1 against SARS-CoV suggests continued evaluation of interferon alphacon1 as a therapeutic treatment for patients infected with SARS-CoV.
DTIC
Coronas; Drugs; In Vitro Methods and Tests; Inhibitors; Interferon; Signs and Symptoms; Viruses

20050196049 Air Force Research Lab., Aberdeen Proving Ground, MD USA
Studies Relating the Fluorescence of CaDPA and DPA to the Fluorescence of Bacillus Spores
Bronk, B. V.; Sarasanandarajah, S.; Setlow, B.; Setlow, P.; May 2005; 31 pp.; In English
Contract(s)/Grant(s): Proj-1710
Report No.(s): AD-A434867; AFRL-HE-WP-TR-2005-0055; No Copyright; Avail: CASI; A03, Hardcopy

Dipicolinic acid (DPA), mostly in the form of Calcium-DPA is a major constituent of bacterial endospores, a non-metabolizing long-term survival form of Bacillus and Clostridium bacterial species. The contribution of this chemical to the autofluorescence or luminescence of these spore is examined primarily by comparing excitation-emission (Ex-Em) graphs taken from a normal strain (DPA+) of Bacillus subtilis spores and from spores of a mutant strain (DPA-) derived from the same DPA + strain. Ex-Em graphs of the pure chemicals CaDPA, DPA and tryptophan are shown to correspond to particular features of these graphs for the spores. When the spores are wet or are in a water suspension, much less influence of the DPA is evident than when they are dry. By comparing the Ex-Em graphs for luminescence from the DPA+spores when they are dry, with these graphs for chemical DPA or CaDPA, regions of the tow dimensional graph are found which corresponds to the fluorescence spectrum of dry CaDPA and also of DPA suggesting that not all the DPA is complexed with Calcium. The same regions become more prominent when the spores are UV irradiated when dry and much more prominent when the spores are UV irradiated in solution. Another experiment shows much more influence of CaDPA when spores are grown in rich medium as compared with spores grown in minimal sporulating medium.
DTIC
Bacillus; Clostridium; Fluorescence; Spores

20050196067 New England Medical Center Hospitals, Boston, MA USA
Role of p53 in Mammary Epithelial Cell Senescence
Dimri, Goberdhan; May 2004; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0509
Report No.(s): AD-A434900; No Copyright; Avail: CASI; A02, Hardcopy

The tumor suppressor p53 plays an important role in a variety of cancers including breast cancer. It inhibits the growth of malignant cells either by inducing G1 arrest, apoptosis or senescence. We previously showed that p53 protein level do not change in senescence of pre-selection HMECs, however p53 and its target gene p21 are significantly upregulated during senescence in post-selection HMECs. Do further study the role of p53 in senescence of postselection HMECs, we used knockdown approach using RNA interference (RNAi) technology. We generated post-selection HMECs stably expressing p53 and p21 RNAi. Here we show that cells with reduced p53 or p21 proteins have extended replicative life span. At the end of life span cells expressing p53 or p21 RNAi entered a crisis like stage without any emergence of immortal clones. Furthermore, we show that compared to p21 RNAi, p53 RNAi expressing cells proliferates for four more population doublings. Our data suggest that other transcriptional targets of p53 may also be involved in replicative senescence of post-selection HMECs. We are using chromatin immunoprecipitation linked PCR, (ChIP)assay to identify these additional targets of p53 involved in replicative senescence of HMECs.
DTIC
Aging (Biology); Breast; Cancer; Mammary Glands

20050196068 Sloan-Kettering Inst. for Cancer Research, New York, NY USA
Phase I and II Trial of Huanglian, A Novel Botanical Against Breast Cancer that Enhances Taxol Activity
Schwartz, Gary K.; Oct. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0486
Report No.(s): AD-A434901; No Copyright; Avail: CASI; A02, Hardcopy

Huanglian is a botanical agent prepared as a tea from the roots of Coptis chinensis. In traditional Chinese medicine it has been used to treat inflammatory conditions ranging from gastroenteritis to acute febrile illnesses with no reported toxicity. We tested huanglian for activity against cancer at MSKCC. We reported that huanglian potently inhibits the growth of a number cancer cells in vitro in a dose-dependent manner, with maximal inhibition at low micromolar concentrations (Li X. et al. Molecular Pharmacology, 58:1287-1293, 2000). MCF-7 and MDA-468 breast cancer lines were particularly sensitive to huanglian. The activity of huanglian was greater than an equivalent concentration of its major component, berberine, suggesting that several components contribute to its anticancer effect. It was therefore decided to take whole huanglian to human trial, as a novel departure from the conventional approach in drug development in which a single agent activity against breast cancer cell lines, huanglian was also shown to enhance the effect of paclitaxel, supporting the future development of huanglian in combination with paclitaxel for the treatment of patients with metastatic breast cancer.
DTIC
Breast; Cancer; Clinical Medicine; Mammary Glands; Toxicity

20050196069 Army Engineer Research and Development Center, Vicksburg, MS USA
Techniques for Measuring Substrate Embeddedness
Sylte, Traci; Fischenich, Craig; Sep. 2002; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434902; ERDC-TN-EMRRP-SR-36; No Copyright; Avail: CASI; A03, Hardcopy

The degree to which fine sediments surround coarse substrates on the surface of a streambed is referred to as embeddedness. Although the term and its measurement were initially developed to address habitat space for juvenile steelhead trout, embeddedness measures have been used to assess fish spawning and macroinvertebrate habitat, as well as substrate mobility. Embeddedness is used as a water quality indicator in some areas. No publication provides a comprehensive description of embeddedness, and the sampling methodology is far from standardized. This technical note represents a compendium of embeddedness measurement techniques, compiled from journal papers, agency reports, and personal files of those involved in the development of the techniques and their applications. This technical note also documents the definitions and usage of the term 'embeddedness,' describes the development of embeddedness measurement techniques, provides guidelines for the application of measurement techniques, and summarizes the existing literature. The information presented here is derived from a study by Sylte (2002) and accompanies an assessment of the methods reported by Sylte and Fischenich (in preparation).
DTIC
Embedding; Habitats; Marine Biology; Measurement; Organisms; Substrates

20050196073 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Culture, Polymerase Chain Reaction and Restriction Fragment Length Polymorphism Studies on Bartonella bacilliformis
Zentrich, Eve C.; May 1997; 41 pp.; In English
Report No.(s): AD-A434909; No Copyright; Avail: CASI; A03, Hardcopy

Bartonella ssp. have gained importance as etiologic agents of human disease, both in temperate and tropical regions. Reports of increasing number of clinical cases of bartonellosis in Peru (B. bacilliformis), documentation of chromic bacteremia in domestic cats with cat scratch fever(b. henselae), and the association of bacillary angiomatosis and parenchymal peliosis (B. henselace and B. quintana) in AIDs patients demand improved laboratory diagnostic detection and isolation techniques for this fastidious organism. We report successful culture and polymerase chain reaction (PCR) techniques applicable for this purpose. Lyophilized B. /bacillioformis was suspended in PUB and cultured on blood and chocolate agar plates to verify survival. Characteristic colonies were used to seed an 8% and 0.7% NaHCO3. Aliquots incubated at 28 C in a candle jar for 3-7 days showed numerous, pleomorphic intraerythrocytic bacteria when thin smears were stained with Giemsa. Ethidium bromide staining and visualization using ultraviolet light of fixed smears of washed red cells showed numerous fluorescent organisms within the cells. B. Henselae was similarly cultivated and detected after incubation at 37 C. This culture system allows for early presumptive detection of Bartonella ssp., taking advantage of the organism's predeliction for intraerythrocytic habitation and the ability to stain fixed RBCs. For PCR, primer were designed to amplify regions between the 16S and 23S rRNA genes of Bartonella, or the entire spacer region. In each case, the primers represented sequences conserved among Bartonella species, and the procedures amplified variable regions 40-1700 bp in length that should be useful for distinguishing species of Bartonella and for molecular epidemiology in restriction length polymorphism analysis.
DTIC
Bacteria; Fragments; Microorganisms; Parasites; Polymerization; Polymers; Polymorphism

20050196082 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
The Delphi Technique Used in Laser Incident Surveillance
Clark, Krystyn R.; Jun. 2004; 76 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434932; No Copyright; Avail: Defense Technical Information Center (DTIC)

Surveillance is an important component of trend analysis in laser incident reporting. Proper surveillance of workplaces in which laser systems are used, personnel at risk of exposure and evaluation of laser injuries can lead to better injury prevention and rapid medical treatment of laser injuries that occur. Ultimately, the prevention laser injuries helps ensure a healthier workforce. Current databases that collect laser incident data were not designed for surveillance of laser incident trends. A laser incident reporting form was created based on a scientific approach for the collection of information about USA Air Force (USAF) laser incident trends, risk factors and injury diagnoses using the Delphi technique. This reporting form was designed also to collect medical evaluation data that could help accelerate the diagnosis and treatment of laser injuries in the field conditions. Four USAF panels were formed from health and safety groups to participate in the Delphi technique: Bioenvironmental Engineers, Health Physicists, Flight Physicians, and Ophthalmologists. Panel members were selected based

on their professional experience with laser systems medical evaluation and/or incident investigations. The Delphi technique used in this study began with 40 participants completing the first round. A total of 27 people completed all three surveys for 67.5% participation. A list of items that panel members determined to be of value for laser incident trend analysis was submitted during the first two rounds of Delphi surveys. The third round consisted of ranking survey items from the first two rounds for data fields to be included in the laser incident reporting form. Ranked survey responses from panel members resulted in 100 data collection items,grouped by four distinct sections. The sections of the form included 12 demographic items, 22 laser system items, 24 event information items, and 42 medical information items.
DTIC
Delphi Method (Forecasting); Injuries; Lasers; Medical Services; Surveillance

20050196087 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Hypoxia Inducible Factor 1 (HIF-1) Activation in U87 Glioma Cells Involves a Decrease in Reactive Oxygen Species Production and Protein Kinase C Activity
Forbes, Robert A.; Jan. 1998; 139 pp.; In English
Report No.(s): AD-A434938; No Copyright; Avail: Defense Technical Information Center (DTIC)

Hypoxia regulates physiological functions including erythropoeisis, ventilatory drive, angiogenesis, vascular tone, and glycolytic function all which are essential for systemic and cellular adaptation to lowered oxygen tension. This is mediated in part through induction of a hypoxia-inducible transcription factor (HIF-1) which is instrumental in the regulation of genes such as vascular endothelial growth factor (VEGF) and erythropoietin (EPO). The purpose of the following work was to identify specific elements of the hypoxic signaling pathways involved in HIF-1 activation in a glial derived cell line (U87 glioma) using gel shift analysis. Since lowering of available oxygen effectively lowers the production of reactive oxygen species (ROS), this shift in ROS production could be the hypoxic signal which mediated HIF-1 induction. Exogenously added H202 prevented HIF-1 activation by hypoxia, and catalase, an enzyme which depletes H202 , was found to activate HIF-1 DNA binding activity under normoxic conditions. Reduction of mitochondrial produced H202 , using thenoyltrifluoroacetone (TTFA), induced HIF-1 DNA binding activity under normoxia. These findings suggest that a decrease in the production of ROS such as H202 during hypoxia may serve as an upstream signal for hypoxic gene expression in gliorna cells.
DTIC
Enzyme Activity; Enzymes; Hypoxia; Oxygen; Oxygen Production; Phosphorus; Proteins; Reactivity

20050196093 Lahey Clinic Medical Center, Boston, MA USA
Apoptosis Based Gene Therapy of Breast Cancer
Karp, Stephen E.; Aug. 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9428
Report No.(s): AD-A434946; No Copyright; Avail: CASI; A02, Hardcopy

The focus of this project is to improve the clinical research efforts of the Lahey Clinic in breast cancer. The Clinic provides care to over 200 women/ year with newly diagnosed breast cancer. The primary goal of this project is to increase the number of women at the Lahey Clinic who participate in clinical studies that evaluate new diagnostic techniques and treatments for women with breast cancer. Unfortunately we did not reach our objective of 20 patients as stated in our statement of work. The major factor was that trial closure limited opportunities for patient enrollment. We have been successful in participating in diagnostic studies for breast cancer, accruing 500 patients this year to studies evaluating new imaging techniques for breast cancer. I developed a prospective process for identification and accrual of new breast cancer patients. I, as well, developed a system that enhances accrual by initiating a formal evaluation process for new breast cancer protocols being considered by our clinicians. We evaluate protocols for scientific merit, feasibility based upon expected patient population size, and economic factors. We believe this committee will help promote patient accrual to breast cancer trials. We hope these efforts will augment clinical trial participation.
DTIC
Apoptosis; Breast; Cancer; Gene Therapy; Mammary Glands; Patients

20050196108 California Univ., Los Angeles, CA USA
Monitoring Cellular Interactions during T Cell Activation at the Single Molecule Level Using Semiconductor Quantum-Dots
Weiss, Shimon; Witte, Owen; Bentolila, Laurent; Pinaud, Fabien; Tsay, James; Radu, Caius; Wang, Lili; Oct. 2005; 8 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0048
Report No.(s): AD-A434965; 4-24946; AFRL-SR-AR-TR-05-0249; No Copyright; Avail: CASI; A02, Hardcopy

Enhanced peptide-coated quantum dots (with high brightness and high saturation intensity) were developed. Two high-affinity targeting 'velcro-pairs' based on avidin-biotin and fluorescine-antibody interactions were demonstrated and used to specifically target single proteins in membranes of live cells. Single molecule spectroscopy and imaging of individual quantum dot-labeled lipid rafts receptors were performed. Software tools were developed to analyze individual diffusion and trafficking trajectories. These studies provide strong support for the lipid raft hypothesis. Cloning and fusion of avidin to four immune synapse components were achieved. These mutants are being characterized by flow cytometry and fluorescence microscopy. This report provides information on the following new findings: (1) hybrid approach to the synthesis of highly luminescent infrared CdTe/ZnS and CdHgTe/ZnS quantum dots; (2) bioactivation and cell targeting of semiconductor CdSe/ZnS quantum dots with phytochelatin-related peptides; (3) development of bright Cd+ rich peptide-coated quantum dots; (4) comparison of the photophysical and colloidal properties of biocompatible quantum dots using fluorescence correlation spectroscopy (FCS); (5) testing the lipid raft hypothesis by single molecule imaging of targeted peptide-coated quantum dots; and (6) molecular cloning and fusion of avidin to immunological synapse (IS) components.
DTIC
Activation; Coatings; Imaging Techniques; Lymphocytes; Peptides; Quantum Dots; Semiconductors (Materials); Target Acquisition

20050196109 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
The Pathoplasty Relationship Between Anxiety Sensitivity and Panic Disorder
Bates, Mark J.; Jan. 2000; 44 pp.; In English
Report No.(s): AD-A434966; No Copyright; Avail: CASI; A03, Hardcopy

Anxiety sensitivity (AS), a belief that symptoms of anxiety (e.g., autonomic arousal) can be harmful (Reiss & McNally, 1985), predisposes individuals to the development of panic disorder (PD). A pathoplasty relationship between two variables is defined when a dispositional variable is associated with the expression or course of a clinical condition. The theoretical and empirical literature on the pathoplastic relationship between AS and PD has only addressed limited aspects of the expression and course of PD in relation to the total AS score. In addition, there has been no evaluation of the pathoplastic relationship between lower-order empirically-established AS dimensions and the full range of PD expression and course This study examined the pathoplasty relationship of total AS and its lower-order sub-factors with variables representing a full range of the expression and course of panic disorder. One hundred and thirty one adults with formally-diagnosed PD volunteered for participation in a PD assessment and treatment research protocol. Information on the expression and course of PD (Panic frequency, intensity, anticipation, avoidance, and core fears) was derived from clinician-rated and self-report measures collected at pre- and post-treatment phases of the study. The three major findings include: (1) AS is related to the major features of PD expression and course, (2) changes in AS correspond to changes in these features, and (3) AS lower- order factors possess specific relationships with features of PD expression and course. These findings suggest that AS is related to the maintenance and treatment of PD. In addition, the specific relationships among AS lower-order factors and PD expression and course features help clarify the means by which AS contributes to the maintenance and treatment of PD, which may lead to improved assessment and treatment models.
DTIC
Anxiety; Clinical Medicine; Panic; Sensitivity; Signs and Symptoms

20050196118 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Neuroprotection Profile of the High Affinity NMDA Receptor Antagonist Conantokin-G
Williams, Anthony J.; Jan. 2002; 74 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434977; No Copyright; Avail: Defense Technical Information Center (DTIC)

Conantokin-G (Con-G or CGX-1007), a potent NR2B subunit selective NMDA receptor antagonist, was evaluated for its neuroprotective properties in experimental models of neuronal injury. In primary neuronal cultures Con-G was shown to decrease excitotoxic calcium responses to NMDA and provide 100% neuroprotection against hypoxia/hypoglycemia (34 μM13-91), NMDA (77 μM42-141), glutamate (819 μM346-1937) or veratradine (2136 μM1508-3026) induced injury (numbers in parentheses indicate EC50 and 95% confidence limits). Con-G (0.1-1 μM) also provided up to 80% protection against staurosporine-induced apoptotic injury (P\h0.01, n = 12/group), which was linked to the NR2B subunit. For in vivo brain injury studies, middle cerebral artery occlusion (MCAo) in the rat was used as a model of transient focal brain ischemia. In this model Con-G (0.01-2.0 nmoles, i.c.v.) reduced brain infarction and improved both neurological and electroencephalographic (EEG) recovery as evaluated both 24 and 72 h post-injury. The maximal neuroprotective effect was measured with the highest dose of Con-G tested (2.0 nmol, i.c.v) with an 89% reduction of core infarct volume (P\h0.05, n = 6-10/group). Post-injury time course experiments demonstrated a therapeutic window out to at least 4 h from the start of

the injury. These neuroprotective effects were also associated with a 50% reduction in the early expression (i.e. 1-4 h) of the c-fos gene (P\h0.05, n = 3-4/group), a preservation of Bcl-2 immunoreactivity at 24 h (P\h0.05, n = 4) , and with a reduction in DNA strand breaks in the ischemic hemisphere as evaluated 24 h post-injury (P\h0.05, n = 6/group).
DTIC
Cerebral Cortex; Electroencephalography; Injuries; Pharmacology

20050196130 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Technologies for Genome-Wide Identification of Stat5 Regulated Genes
LeBaron, Matthew J.; Jan. 2003; 284 pp.; In English
Report No.(s): AD-A435003; No Copyright; Avail: Defense Technical Information Center (DTIC)

Each year more than one million new cases of breast cancer are diagnosed worldwide and an estimated 370,000 women die from breast cancer. Although the vast majority of fatal breast cancer cases involve metastatic spread of the primary tumor, the formation of metastases is still a poorly understood, complex process. Identifying the early molecular changes that facilitate metastasis of breast cancer will lead to new molecular targets for prevention of metastases and improved therapies. Intriguing data from the mentor's laboratory show loss of activation of the transcription factor Stat5 during breast cancer progression and that tumors without active Stat5 have higher histological grade, increased mitotic rate, and unfavorable prognosis. Furthermore, data developed in the preparation of this dissertation indicate a substantial growth-inhibitory and pro-differentiation role for Stat5 in mammary epithelial cells. Based on these and other recent observations, we postulate that loss of Stat5 activation in breast cancer represents a progression event that leads to dedifferentiation and increased risk of metastatic invasion. Therefore, a critical analysis of the role of Stat5 in human breast cancer is warranted, including systematic efforts to identify genes directly controlled by Stat5. The recent completion of the human genome sequence presents new opportunities for global identification of Stat5 target genes. Work performed in the preparation of this dissertation has established new methodology to capture, clone, sequence, and validate physiological Stat5 DNA-binding sites in a genome-wide manner. The method can also be used to determine whether Stat5 interacts with a known Stat5-responsive promoter within a given experimental context when coupled with PCR amplification of the target DNA. Using this methodology, we have demonstrated that glucocorticoids markedl
DTIC
Breast; Cancer; Genes; Genome; Mammary Glands; Metastasis

20050196131 Foreign Military Studies Office (Army), Fort Leavenworth, KS USA
Viral Hepatitis and the Russian War in Chechnya
Grau, Lester W.; Jorgensen, William A.; Sep. 1998; 11 pp.; In English
Report No.(s): AD-A435004; FMSO/KS-98-23; No Copyright; Avail: Defense Technical Information Center (DTIC)

The ill-equipped and ill-prepared Russian Army that staggered into and out of the war in Chechnya experienced several critical health problems. The all-too-familiar Russian problem of lack of field sanitation was again apparent as 95% of the infectious disease among the Russian combatants was passed through fecal-oral transmission. A modest 3.7% of infectious disease was passed through airborne transmission and the other 1.3% were other modes of infection. Over half of the intestinally-related infections (53.2%) were from viral hepatitis while 27.7% were from shigellosis and 20.1% were from enterocolitis. Outbreaks of diphtheria, cholera, malignant anthrax, 2 and plague also threatened the health of the Russian soldiers. There were approximately 400 diagnosed cases of cholera in Chechnya in 1994. Acute viral hepatitis and cholera were the two major diseases that Russian medical personnel had to contend with. Both are endemic to squalid living conditions and confined living space found in ill-regulated field camps and deployment areas. Initially, Russian laboratory personnel deployed to Chechnya lacked the diagnostic tools needed to differentiate among hepatitis A, B, C, D and E--a necessary distinction so that proper preventive measures could be taken within the deployed forces. The Russian military introduced an Israeli diagnostic system from the 'Orgenics' firm and a Russian diagnostic system from Nizhny Novgorod which allowed these laboratory personnel to develop a methodology for identifying the various types of hepatitis.
DTIC
Health; Hepatitis; Infectious Diseases; Sicknesses; Viral Diseases; Viruses; Warfare

20050196132 Agency for Healthcare Research and Quality, Rockville, MD USA
Creating a Curriculum for Training Health Profession Faculty Leaders
Mitchell, Pamela H.; Robins, Lynne S.; Schaad, Dotiglas; Jan. 2005; 15 pp.; In English
Report No.(s): AD-A435006; No Copyright; Avail: Defense Technical Information Center (DTIC)

Objectives: An interprofessional, collaborative group of educators, patient safety officers, and Federal program directors teamed up to create an integrated, patient safety-centered curriculum for the education of physicians, nurses, and other health professional faculty leaders. Methods: Executive and advisory committees became a collaborative team, surveying and cataloguing existing educational tools and materials. They synthesized materials about patient safety and interprofessional collaboration to provide faculty with tools for assessing and improving their current teaching practices that influence patient safety. Results: The curriculum consists of a modular handbook and linked train-the-trainer workshop exercises on the key theme: improving the culture of safety through improving interprofessional collaboration. Five topics structure the curriculum: Patient Safety Basics, Developing Academic Leadership, Improving the Culture of Practice, Changing the Response to Error, and Applied Principles of Interprofessional Teaching and Learning. Conclusions: One hundred thirty-seven faculty and staff educators from 9 States, representing 14 health professions, have used the curriculum through the workshop mode. Based on their estimates of the number of health professionals and students in their spheres of influence, they have the potential to influence more than 10,000 individuals in improving patient safety through interprofessional collaboration.
DTIC
Education; Health; Management Systems; Medical Services

20050196134 Massachusetts General Hospital, Boston, MA USA
Enabling Technologies for Advanced Soft Tissue Modeling
Dawson, Steven L.; Sep. 2004; 48 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0677
Report No.(s): AD-A435009; No Copyright; Avail: CASI; A03, Hardcopy

Soft tissue properties represent a major and significant unknown in the domain of medical modeling and simulation. This program presents a 4-year research effort in defining tissue characteristics of three distinct organs (liver, spleen, and kidney) in vivo. Over the course of this program, we will use novel methods of tissue interrogation to characterize non-linear behavior during slow deformations, as would commonly be seen during surgical manipulations. We will then develop mathematical models that can be optimized to permit near real-time representations of organ behaviors, including the boundary characteristics of organs in situ. Year 3 has seen: the beginning of the motorization of our large deformation indenter; data showing that our perfusion system supports tissue so that in vitro tests closely approximate in vivo tests; indications that we can capture and distinguish properties of the organ capsule and parenchyma with our small and large indentation devices,; development of a hybrid large-deformation and 3-D ultrasound scanning technique; FEM implementing a variety of non-linear constitutive laws; an image-based system for studying 'knife-edge' plane strain deformation of tissues; extended gel phantom work from year 2 including international collaborations; acquisition of external funding to extend the vocal tissue measurement work from year 2.
DTIC
Deformation; Finite Element Method; Mathematical Models

20050196137 Pennsylvania Univ., Philadelphia, PA USA
Identifying Somatic Genetic Changes in Prostate Cancer
Nathanson, Katherine L.; Feb. 2005; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0022
Report No.(s): AD-A435018; No Copyright; Avail: CASI; A02, Hardcopy

Metastatic prostate cancer is not a curable disease and approximately 30% of men undergoing radical prostectomy will relapse, so there is a need to identify new markers of development and progression of prostate cancer, particularly those that can be used as potential therapeutic targets. We are using aCGH and expression profiling to examine prostate cancers from men whom have been followed for 10 years on average. We are in the process of reviewing prostate specimens for cancer, macrodissecting them, extracting DNA and RNA for array based comparative genomic hybridization (aCGH) and expression profiling. In this progress report, we review our progress to date, which includes identifying many of the previous known genes found to be commonly amplified and deleted in prostate cancer, such as TERT and HRAS, and NKX3-1 and PTEN, respectively. In addition, we have identified deletions and amplifications of novel genes not been shown to be changed in prostate cancer previously. Of greatest interest is GRB2, which functions upstream of the Ras signaling pathway. Ras signaling has been postulated to be important in androgen independent prostate cancer progression. In addition, targeted chemotherapy is being developed for GRB2 making it an important gene to understand further in prostate cancer.
DTIC
Cancer; Genes; Genetics; Identifying; Metastasis; Prostate Gland

20050196138 Fox Chase Cancer Center, Philadelphia, PA USA

Evaluating an Interactive, Multimedia Education and Decision Program for Early-Stage Prostate Cancer Patients in a Randomized Controlled Trial

Diefenbach, Michael A.; Feb. 2005; 6 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0179

Report No.(s): AD-A435019; No Copyright; Avail: CASI; A02, Hardcopy

Despite advances in treatment, uniform treatment recommendations for localized prostate cancer have yet to emerge. Consequently, men with this diagnosis are faced with a complex set of disease information and treatment challenges as they select a treatment option (Diefenbach, et al., 2002). To educate patients about prostate cancer and its treatment and to ease their decisional burden, we have developed an innovative CD-ROM based multimedia prostate cancer interactive education system. The development of the software has been guided by our cognitive-affective, self-regulation theoretical framework (Diefenbach & Leventhal, 1996; Miller & Diefenbach, 1998). PIES uses the metaphor of a health center. Patients can explore various rooms to interactively obtain treatment and disease information. PIES goes beyond the inclusion of text, video, audio, and animation, by providing a unique intelligent expert system that tailors text information to the patient's information seeking preferences (high vs. low monitoring; Miller, 1996; Miller & Diefenbach, 1998). Research has identified high monitors as information seeking and being more distressed compared to low monitors, who are classified as information distracting and being less distressed.

DTIC

Cancer; Education; Multimedia; Patients; Prostate Gland; Random Variables

20050196141 Johns Hopkins Univ., Baltimore, MD USA

Characterization of the Role of Heyl in Angiogenesis and Breast Cancer Development

Han, Liangfeng; Mar. 2005; 21 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0382

Report No.(s): AD-A435022; No Copyright; Avail: CASI; A03, Hardcopy

Neoangiogenesis process involves complex genetic expression alterations in endothelial cells. We performed SAGE analysis on purified endothelial cells from two freshly resected breast carcinoma and one normal breast tissue, finding that the expression of HEYL, a basic helix-loophelix (bHLH) transcription repressor, is consistently higher in the breast cancer libraries compared to normal breast tissue. Our in situ hybridization analysis using single sections and multi-tissue arrays validated the SAGE results. To investigate the effect of HEYL on endothelial cells, we infected human umbilical vein endothelial cell (HUVEC) using adenovirus expressing HEYL. We found that the expression of HEYL can increase HUVEC proliferation. Under serum starvation, the cells expressing HEYL showed strong anti-apoptosis ability compared to control cells. In addition, the HEYL expressing cells elongated 3 days after infection and showed actin rearrangement. These elongated cells have increased invasion ability in Boyden chamber assay. We found that PI-3 kinase signal transduction pathway involved in the cell invasion, since PI-3 kinase inhibitor can effectively block the invasion.

DTIC

Breast; Cancer; Endothelium; Genetics; Mammary Glands

20050196142 California Univ., Los Angeles, CA USA

Identification and Characterization of the Ligand of Prostate Specific Membrane Antigen

Anilkumar, Gopalakrishnapillai; Jan. 2005; 11 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0132

Report No.(s): AD-A435023; No Copyright; Avail: CASI; A03, Hardcopy

Prostate Specific Membrane Antigen (PSMA) is a transmembrane protein expressed predominantly in prostate' epithelial cells. The expression of PSMA increases several fold in cancer cells, and recently it was shown that, PSMA is involved in the modulation of invasiveness of prostate cancer cells. The objective of this project was to identify a potential ligand for PSMA. For this purpose, we have employed the yeast two-hybrid system using different regions of the extracellular domain of PSMA as baits and screened a human prostate specific cDNA expression library. In this screen, we have identified three extracellular matrix components, collagen XVIII, fibulin like protein, and laminin 5 receptor like protein as potential interacting partners of PSMA.

DTIC

Antigens; Cancer; Collagens; Ligands; Membranes; Prostate Gland; Proteins

20050196144 Brown Univ., Providence, RI USA
Electroacoustic Tissue Imaging
Diebold, Gerald J.; Apr. 2005; 33 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0307
Report No.(s): AD-A435025; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this research has been to develop new methods of imaging tumors. The primary effort has been in developing an imaging method based on the ultrasonic vibration potential. We have formulated a complete theory of image formation for an arbitrary shape object irradiated by a plane wave. Experiments have been carried out that verify the theory and demonstrate straightforward examples of the use of the method. Work has focused on construction and optimization of an apparatus for scanning a transducer and recording images. Additionally, we have investigated the use of phase contrast x-ray imaging for tumor detection using ultrasonic radiation pressure to modify x-ray phase contrast images. Experiments have been carried out with phantoms to demonstrate the method.
DTIC
Cancer; Detection; Electroacoustics; Imaging Techniques; Plane Waves; Ultrasonic Radiation; Vibration

20050196147 Israel Inst. for Biological Research, Ness-Ziona, Israel
Generation of Recombinant Human AChE Op-Scavengers With Extended Circulatory Longevity
Shafferman, Avigdor; Kronman, Chanoch; Ordentlich, Arie; Velan, Baruch; Kaplan, Dana; Seliger, Nehama; Cohen, Ofer; Lazar, Arie; Barak, Dov; Zilberstein, Lea; Lazar, Shirley; Apr. 2005; 49 pp.; In English
Contract(s)/Grant(s): DAMD17-03-C-0012
Report No.(s): AD-A435028; No Copyright; Avail: CASI; A03, Hardcopy

We demonstrated in the past that chemical conjugation of polyethylene glycol (PEG) moieties to recombinant human acetylcholinesterase (rHuAChE) gives rise to OP bioscavenger species which reside for very long period of time in the circulation of mice, regardless of their post-translation- modification state. These findings allow for production of rHuAChE not only in eukaryotic cells but also in bacterial cost-effective systems. A synthetic human AChE gene was constructed and its expression was analyzed under control of various potent transcription promoters in Bacillus brevis cells. The potential use of this system for large-scale production of AChE is presently being assessed. We have begun a series of studies to determine the effect of removal of human AChE lysine residues, which serve as tar et sites for PEG-conjugation, on the enzymatic and pharmacokinetic performance and on the degree of homogeneity of the enzyme product. In other studies we demonstrated that AChE PEGylation results in a major reduction of the immunogenicity of the enzyme. In structure-function studies of AChE, we compared the reactivities of enantiomers of VX and their noncharged isosters, as well as ecothiophate, in conjunction with a battery of AChE mutants. These studies allowed us to define two subsites, located in the active site and peripheral anionic subsites, which confer enzyme stereoselectivity to CW agents such as VX.
DTIC
Acetyl Compounds; Cholinesterase; Circulation; Glycols; Scavenging

20050196149 Michigan Univ., Ann Arbor, MI USA
Biological Differences Between Prostate Cancer Cells that Metastasize to Bone Versus Soft Tissue Sites
Pienta, Kenneth J.; Dec. 2004; 36 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0098
Report No.(s): AD-A435031; No Copyright; Avail: CASI; A03, Hardcopy

We have expanded our previous studies to catalog the clinical data, distribution of PCa involvement, morphology, immunophenotypes, and gene expression from 30 rapid autopsies of men who died of hormone refractory PCa. A Tissue microarray (TMA) and cDNA microarray was constructed and quantitatively evaluated for expression of several biomarkers and genes. Comparisons were made between patients as well as within the same patient. No consistent differences were found between bone and soft tissue sites that could explain the predilection of prostate cancer cells to metastasize to bone. This suggests that biologic differences leading to the predominant pattern of prostate cancer metastasis to bone may be related to the bone 'soil' rather than the prostate cancer 'seed'. Metastatic hormone refractory PCa has a heterogeneous morphology, immunophenotype, and genotype, demonstrating that 'metastatic disease' is a group of diseases even within the same patient. An appreciation of this heterogeneity is critical to evaluating diagnostic and prognostic biomarkers as well as designing therapeutic targets for advanced disease. Further investigation of the bone versus soft tissue stroma in cancer versus normal tissue is warranted.
DTIC
Bones; Cancer; Metastasis; Prostate Gland

20050196151 Burnham Inst., La Jolla, CA USA
Hypoxia as a Driving Force for Genetic Instability During Breast Tumorigenesis
Abraham, Robert T.; Oct. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0730
Report No.(s): AD-A435033; No Copyright; Avail: CASI; A02, Hardcopy

The overall hypothesis that drives this project is that persistent replication stress generates mutational events in breast epithelial cells that fuel breast cancer (BCa) progression. Our model predicts that a major source of replicative stress in BCa is hypoxia, which stalls active replication forks, and selects for cells that have bypassed the this S-phase checkpoint due to mutations in the ATR-hchkl pathway. The specific aims of this project are: (1) to define the role of the ATR checkpoint pathway in hypoxia-induced cytostasis, and (2) to determine whether defects in this checkpoint pathway promotes BCa progression, and confers sensitivity to killing by certain anticancer agents.
DTIC
Breast; Chemotherapy; Drugs; Genetics; Hypoxia; Mammary Glands; Proteins; Stability

20050196152 Manitoba Univ., Winnipeg, Manitoba Canada
The Role of HGCP3-Psoriasin Interaction in Human Breast Cancer
Cooper, Charlton M.; Apr. 2005; 16 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0402
Report No.(s): AD-A435034; No Copyright; Avail: CASI; A03, Hardcopy

The core of my hypothesis is that psoriasin, a protein shown to be aberrantly expressed at different stages of breast cancer, physically interacts with hGCP3, an indispensable component of the *-tubulin ring complex involved in centrosome function. Aims for the first year of the project were to determine if a Histidine-tagged hGCP3 (His-hGCP3) construct previously generated in our lab is biologically suitable for this study and to substantiate an interaction between psoriasin and hGCP3 in mammalian cells using immunofluorescent co-localization and biochemical co-immunoprecipitation (co-IP) assays. In the first year I have shown that the His-tag does not interfere with His-hGCP3 ability to interact with *-tubulin by co-IP assays; that expression of this construct does have a mild cytotoxic effect but is not completely lethal; that available psoriasin antibodies are not suitable for IF labeling therefore preventing co-localization studies with hGCP3, that psoriasin and His-hGCP3 cannot be consistently co-IP'ed suggesting at best, a weak or a possible cell-cycle dependent interaction exists. Using two assays to measure centrosome function, a quantitative assay for microtubule (MT) nucleation and a mitotic spindle morphology assay, I've further ascertained that psoriasin expression in does not alter centrosome function.
DTIC
Breast; Cancer; Mammary Glands; Proteins

20050196155 Virginia Univ., Charlottesville, VA USA
High Resolution Anatomic and Elastographic Transrectal Ultrasound for Improved Diagnosis of Prostate Cancer
Hossack, John A.; Feb. 2005; 26 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0240
Report No.(s): AD-A435037; No Copyright; Avail: CASI; A03, Hardcopy

In this work we improve upon conventional Digital Rectal Examination (DRE) and PSA blood test by using ultrasound elasticity imaging. A latex sheath over the transrectal ultrasound probe is slightly inflated with water to provide a source of moderate pressure. The elasticity image is generated by cross-correlating successive raw radio frequency image data sets for incrementally increasing pressure Strain, and consequently elasticity, can be calculated from the displacement image. Our second objective is to use a new freehand 3D acquisition approach to obtain 3D image data sets. This approach uses a slightly modified transducer and an image motion tracking technique. Preliminary phantom based results are presented in this report. Excellent progress has been made with respect to the Statement of Work and first three of four total Specific Aims: A transducer has been specified and is on order. As promised, this transducer is designed to possess unsurpassed prostate scanning resolution by virtue of its exceptionally high frequency - up to 14 MHz. Prototype phantoms and complete ultrasound test instrumentation has been assembled. Preliminary ultrasound image speckle reduction work has been performed. Preliminary, dimensionally accurate, 3D prostate phantom images have been produced.
DTIC
Anatomy; Cancer; Diagnosis; High Resolution; Prostate Gland; Ultrasonics

20050196158 North Carolina Univ., Chapel Hill, NC USA

Identification of Markers of Human Vascular Dynamics Exposed in the Human Vasculature of Human Prostate Xenografts by Androgen Deprivation

Smith, Gary J.; Feb. 2005; 18 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0264

Report No.(s): AD-A435042; No Copyright; Avail: CASI; A03, Hardcopy

The goals of this project are: 1) demonstration that androgen deprivation produces transient/permanent prostatic vascular damage; and, 2) characterization of vascular targets for molecular treatment modalities that are induced/unmasked by androgen deprivation. Progress during the initial year has focused on immunohistochemical evaluation of the kinetics of changes induced in the prostate vasculature and surrounding tissue, and on demonstration of induction of a pro- coagulative state indicative of acute vascular damage. Characterization of change in markers of vascular stability, and endothelial, epithelial and stromal cell proliferation and death, demonstrates clearly that the vascular endothelial compartment is labilized maximally at two days post-androgen deprivation, and rebounds between 7-l4 days after androgen deprivation. Three-dimensional reconstruction of the prostatic vasculature from xenografts perfused with fluorescently labeled lectin demonstrates induction of areas of denuded vascular basement membrane is accompanied by leakage of lectin and fibrinogen into the interstitial tissue space and appearance of Tissue Factor on endothelial cell surfaces. Studies in year two will focus on verification of areas of vascular damage utilizing human platelets, and on characterization of new/unmasked targets by phage display. Induction of acute vascular damage suggests the opportunity for specific therapeutic targeting without risk of morbidity associated with long-term hormonal therapy.

DTIC

Cancer; Cardiovascular System; Deprivation; Hormones; Males; Markers; Prostate Gland; Target Acquisition

20050196159 Texas Univ., Houston, TX USA

Wilms' Tumor 1 (WT1) as a Novel Molecular Target in Breast Cancer

Tari, Ana M.; Apr. 2005; 10 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0459

Report No.(s): AD-A435044; No Copyright; Avail: CASI; A02, Hardcopy

High levels of Wilms' Tumor 1 (W%T1) mRNA in breast tumors are linked with poor prognosis for breast cancer patients. However, the function of WT1 protein in breast cancer is not known. Recently we demonstrated that the HER2/neu oncogene, which is a well-known poor prognostic indicator for breast cancer patients, engages Akt to increase WT1 expression to stimulate G1 to S phase cell cycle progression and suppress apoptosis in breast cancer cells. Increased G1 to S phase cell cycle progression and decreased apoptosis are correlated with increased cyclin D1 and Bcl-2 levels. We have preliminary data indicating that Insulin-like Growth Factor-I also uses the Akt pathway to increase WT1 protein expression. We are currently investigating the role of WT1 in Insulin-like Growth Factor-I signaling. WT1 has been shown to undergo two splicing events, which result in four different isoforms. Our preliminary data indicate that all four WT1 isoforms enhance the proliferation of MCF-7 breast cancer cells, and reduce their sensitivity to tamoxifen. However, the WT1 isoforms do not appear to modulate the sensitivities of MCF-7 cells to doxorubicin and taxol. We plan to determine the mechanisms and the isoforms by which WT1 deregulates breast cancer cell proliferation and tamoxifen sensitivity.

DTIC

Apoptosis; Breast; Cancer; Mammary Glands; Targets; Tumors

20050196160 Cornell Univ., Ithaca, NY USA

Role of the Non-Receptor Tyrosine Kinase ACK2 in EGF Receptor Degradation

Stearns, Carrie; Apr. 2005; 13 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0064

Report No.(s): AD-A435047; No Copyright; Avail: CASI; A03, Hardcopy

Epidermal growth factor receptor and members of the ErbBeta family of receptor tyrosine kinases have been implicated in several mitogenic pathway. Regulated growth factor-mediated signaling relies upon a balance between receptor activation, endocytosis, and degradation. As a result, overexpression or mutations altering receptor kinase activity is often sufficient to cause malignant transformation. We are interested in the emerging role of the nonreceptor tyrosine kinase, ACK2, and its substrate, SH3PXl, in regulating ErbBeta family degradation. Establishing a role for ACK2 and SH3PXl in ErbBeta-2 receptor degradation is especially appealing based on the predictive property between receptor overexpression and breast cancer. Currently, we are interested in characterizing the ACK2-SH3PXl interaction and determining the significance of ACK2-dependent phosphorylation of SH3PXl in cells. To address these objectives, we have carried out deletion analysis studies to

delineate the region of the phosphorylation on SH3PXl. Based on these studies, we conclude that SH3PXl phosphorylation is lost in the truncation mutant DeltaC339. In parallel site-directed mutagenesis studies, we conclude that all conserved point-mutants of SH3PXl retain tyrosine phosphorylation. Given these findings, we believe that Mass Spectrometry may provide a more sensitive means to identify the ACK2 phosphorylation site(s) on SH3PXl and efforts have been made to generate recombinant forms of ACK2 and SH3PXl. In addition, in vitro kinase screens for inhibitors of ACK2 have been carried out at the high-throughput facility at Merck& Co., Inc. The pyrido-pyrimidine compound from Park Davis (PD158780) has been shown to effectively block ACK2 in vitro and additional experiments will be carried out to determine its activity in vivo. The ability to regulate this phosphorylation event will help to determine the importance of ACK2 activity in receptor endocytosis and degradation.
DTIC
Breast; Cancer; Degradation; Enzymes; Mammary Glands; Phosphorus; Phosphorylation; Proteins; Tyrosine

20050196161 Miami Univ., FL USA
MIC-1, A Potential Inhibitor of Breast Tumor Progression
Koniaris, Leonidas G.; Oct. 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0723
Report No.(s): AD-A435049; No Copyright; Avail: CASI; A02, Hardcopy

MIC-l is a member of the transforming growth factor-beta family of growth and differentiation factors. MIC-l is expressed in breast tissue and has numerous specific effects including inhibiting both breast development and breast duct proliferation. We hypothesize, therefore, that MIC-l may play a role in inhibiting breast cancer progression. In order to study this question we have generated genetically modified mi in which murine MIC-l expression is abolished (null mice). We are in the process of breeding these MIC-1 null mice with mouse lines that are predisposed to the development breast cancer and this will be examined in the upcoming year as a no-cost extension of this grant. We will analyze the effects of the absence of MIC-l on the rate of breast malignancy development in these animals comparing it to those that have intact MIC-l production. If our hypothesis is correct, MIC-l null mice will exhibit increased incide and/or severity of breast cancer. As such, these studies may identify an important anti tumor pathway in breast cancer, potentially providing novel strategies and targets for chemical therapeutics or diagnosis.
DTIC
Breast; Cancer; Inhibitors; Mammary Glands; Tumors

20050196162 Scripps Research Inst., La Jolla, CA USA
Novel Combination Therapy for Prostate Carcinoma
Xiang, Rong; Feb. 2005; 33 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0137
Report No.(s): AD-A435053; No Copyright; Avail: CASI; A03, Hardcopy

The hypothesis driving this project is that effective blocking of tumor angiogenesis by a DNA vaccine encoding the entire VEGF receptor Flk-l gene induces effective T cell-mediated immunity against proliferating endothelial cells overexpressing Flk-1. This eradicates tumor growth and metastases of RM-2 prostate carcinoma in syngeneic mice. We established that a novel oral DNA vaccine encoding the entire Flk-1 gene successfully suppresses tumor growth and metastases by targeting genetically stable, proliferating endothelial cells in the tumor vasculature rather than mutating tumor cells. This vaccine effectively protected mice from lethal challenges of RM-2 prostate carcinoma cells in a prophylactic model and reduced growth of established metastases in a therapeutic setting. Furthermore, angiogenesis in the tumor vasculature was suppressed without impairment of fertility, neuromuscular performance or hematopoiesis, although with a slight delay in wound healing. We also constructed the first anti-angiogenic Flk-1 minigene vaccine and identified the initial H-2 Db-restricted Flk-1 epitope-FLK((sub 400) (VILINPISM) specifically recognized by CD8+T cells. Importantly, these minigene vaccines achieved similar antitumor efficacy as the DNA vaccine encoding the entire Flk-l gene. Additionally, we elucidated specific CTL-mediated immune mechanisms induced by the Flk-l-based DNA vaccine against RM-2 prostate carcinoma.
DTIC
Angiogenesis; Cancer; Genetics; Hematopoiesis; Prostate Gland; Therapy

20050196163 Pennsylvania State Univ., University Park, PA USA
Synthetic Inhibitors of Ras Palmitoylation: Defining a Novel Class of Drugs Targeting Breast Cancers
Peterson, Blake R.; Sep. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0658
Report No.(s): AD-A435054; No Copyright; Avail: CASI; A02, Hardcopy

Members of the Ras family of oncoproteins cause a high percentage of human cancers. Cancer proliferation can result from mutations in ras genes, overexpression of Ras proteins, or the aberrant activation of pathways that impinge on Ras signaling. Ras proteins must be posttranslationally modified with farnesyl and palmitoyl lipids to associate with the plasma membrane and exhibit transforming activity. Consequently, inhibitors of Ras farnesylation halt the growth of breast and other cancers. However, in addition to farnesylation, the palmitoylation of Ras cysteine residues by the enzyme palmitoyl acyltransferase (PAT) contributes to the transforming activity of Ras. Hence, the development of potent and selective inhibitors of PAT could define a novel class of anticancer agents. To identify compounds that affect Ras palmitoylation, we synthesized a novel fluorescent Ras-mimetic substrate. This and a related Src-mimetic substrate were used to investigate a small molecule inhibitor of PAT termed JF081204. To test the hypothesis that this inhibitor may exhibit anticancer activity by blocking palmitoylation of Ras proteins, we evaluated JF081204 as an anticancer agent, synthesized analogues to investigate structure activity relationships, and probed the mechanism of action of these compounds. We demonstrated that JF081204 inhibits PAT activity in platelets but does not inhibit palmitoylation of Ras in cancer cell lines.
DTIC
Breast; Cancer; Drugs; Genes; Inhibitors; Mammary Glands; Proteins

20050196164 Kansas Univ., Kansas City, KS USA
The Role of AKT in Androgen-Independent Progression of Human Prostate Cancer
Li, Benyi; Feb. 2005; 20 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0121
Report No.(s): AD-A435055; No Copyright; Avail: CASI; A03, Hardcopy

To define the causative role of the active Akt in androgen-independent progression of prostate cancer, an inducible Akt (iAKT) is used in this proposal. In this second-year period, androgen-dependent human prostate cancer LNCaP cells stably transfected with vectors carrying iAKT system or the control vectors (empty and kinase-dead mutant iAKTkm) were used to determine if active Akt can protect cell death or promote cell proliferation after serum starvation. We demonstrated that CID-mediated activation of iAKT promotes cell survival only but not cell proliferation of prostate cancer LNCaP cells after androgen or serum withdrawal. We also demonstrated that the established LNCaP.iAKT cells formed xenograft in nude mice and CID) AP22783 injection showed a promising ability to activate the iAKT, and the activated iAKT is functionally capable to phosphorylate the downstream target GSK-3. In the next year, we will use those LNCaP subline cells to determine whether CID-mediated iAKT activation promote tumor growth in castrated nude mice.
DTIC
Cancer; Hormones; Males; Prostate Gland

20050196166 McMaster Univ., Hamilton, Ontario Canada
Development and Evaluation of Computer-Based Versions of the Decision Board for Early Breast Cancer
Whelan, Timothy J.; Nov. 2004; 19 pp.; In English
Contract(s)/Grant(s): DAMD17-98-1-8100
Report No.(s): AD-A435057; No Copyright; Avail: CASI; A03, Hardcopy

Women with breast cancer have indicated their desire to be involved in decisions about their care. We have developed a decision aid, called the Decision Board, for women regarding choices in breast cancer with respect to surgical treatment and adjuvant chemotherapy. Randomized trials have demonstrated that the Decision Board not only increases patient knowledge, but improves patient satisfaction, decreases decisional conflict, and facilitates shared decision-making between the physician and the patient. This present study builds on previous work and involves the development of versions of the Decision Board using different types of media in order to improve the effectiveness of these instruments. Two new versions have been produced: a computer-based version, which is presented on a laptop computer, and an easy-to-use paper based version which are being compared with a standard poster size foam-core version in a randomized trial. Important outcomes will include patient comprehension and acceptability. Currently 212 patients are entered into the study, with a target of 300 by October 2005. Newer versions of the Decision Board that are easier to use and present will lead to wider use in the community resulting in more knowledgeable and satisfied breast cancer patients.
DTIC
Breast; Cancer; Computer Techniques; Mammary Glands; Medical Services

20050196167 Maryland Univ., Baltimore, MD USA
Silk-Elastinlike Copolymers for Breast Cancer Gene Therapy
Ghandehari, Hamid; May 2005; 43 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0237
Report No.(s): AD-A435058; No Copyright; Avail: CASI; A03, Hardcopy

The overall purpose of the project is to use silkelastin-like polymers (SELPs) for the development of controlled gene delivery systems for localized breast cancer gene therapy. The rationale is that by controlling the structure of the polymer, it is possible to control DNA release, duration of transgene expression and the corresponding reduction in tumor size. In year 2 progress was made in the following areas: i) Finished the biosynthesis of three SELP 415K analogs with incremental increase in molecular weight and started on the biosynthesis of SELP 815K, ii) Compared the physicochemical characteristics of hydrogels made from SELP 415K and SELP 47K, iii) Compared the DNA release characteristics of hydrogels made from SELP 415K and SELP 47K and evaluated the interaction of DNA with these polymers. The next logical steps are to finish the biosynthesis of the third analog (815K), conduct characterization and release studies using hydrogels made from this analog and evaluate the delivery systems in murine models of breast cancer as proposed in the application.
DTIC
Breast; Cancer; Copolymers; Gene Therapy; Mammary Glands; Polymers; Silk

20050196168 New Mexico Univ., Albuquerque, NM USA
Prenatal Alcohol Exposure Damages Brain Signal Transduction System
Caldwell, Kevin K.; Sep. 2004; 73 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0582
Report No.(s): AD-A435060; No Copyright; Avail: CASI; A04, Hardcopy

This final report details the results of our studies. The proposal's overall goal is to uncover biochemical mechanisms that underlie learning and memory. These studies have yielded novel information about the effects of fear conditioning on brain phospholipase C-Betala (PLC-Betala), indicating that PLC-Betala may play an important role in the biochemical processes underlying fear-conditioned learning and memory formation. We have uncovered the molecular basis of the observed association between PLC isozymes and extracellular signal-regulated protein kinase. In addition to increasing our understanding of the biochemical basis of learning and memory, these studies have yielded important information about the neurochemical mechanisms that underlie fear and stress, and, consequently, may provide insight into the neurochemical basis of posttraumatic stress syndrome.
DTIC
Alcohols; Brain; Damage; Exposure; Genetics; Transferring

20050196169 Vanderbilt Univ., Nashville, TN USA
Therapy Selection by Proteomic Profiling
Hayward, Simon W.; Feb. 2005; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0242
Report No.(s): AD-A435061; No Copyright; Avail: CASI; A02, Hardcopy

The long term goal of this work is to develop a new prognostic tool with which to determine the response of a patient to a given therapy, with the view of providing the most appropriate treatments tailored to individual patients. The central hypothesis of this proposal is that a subset of the proteins expressed in a prostate tumor can be used to predict response to specific therapeutic regimens. The purpose of this work is to generate predictive methods which will allow patients to be selected for specific treatment protocols. In this year, per our proposed schedule, we have focused on acquisition of tissue samples and their grafting and treatment in SCID mouse hosts. In line with DAMD17-03-1-0047, a modification of the control arm of the study has been made to reflect changes in clinical practice occurring around the inception of the study which are likely to persist for the foreseeable future. Other minor technical improvements have also been made relating to the microarray plans and the method for detecting apoptotic cells. The project is proceeding on its predicted timeline as outlined in the accepted statement of work.
DTIC
Cancer; Prostate Gland; Proteome; Therapy

20050196170 University of South Florida, Tampa, FL USA
Computerized Analysis and Detection of Missed Cancer in Screening Mammogram
Li, Lihua; Apr. 2005; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0212
Report No.(s): AD-A435062; No Copyright; Avail: CASI; A03, Hardcopy

This project is to explore an innovative CAD strategy for improving early detection of breast cancer in screening mammograms by focusing on computerized analysis and detection of cancers missed by radiologists. The research in the second year is on (i) continuation of missed cancer analysis with a focus on density analysis and its effect on CAD detection; (ii) new CAD system design. The achievements include (1) A comprehensive analysis was taken on the effect of breast density on cancer detection. The accomplishments include breast dense tissue segmentation, correlation analysis of mammogram density features between missed and detected stages, statistical testing of density difference between normal and cancerous mammograms, baseline study of the effect of density on CAD detection performance using existing algorithm. (2) A new CAD system was designed based on the existing secondgeneration CAD algorithm and the missed cancer analysis. Due to the effective modification strategies taken in the new system, detection performance was improved for mammograms at both detected and missed stages. However, with the focus on missed cancer analysis and detection, a bigger improvement was obtained in detecting missed cases even though the general detection performance is still lower than that at detected stage. DTIC

Breast; Cancer; Computer Techniques; Diagnosis; Mammary Glands

20050196172 Duke Univ., Durham, NC USA
Task-Specific Optimization of Mammographic Systems
Saunders, Robert; Mar. 2005; 51 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-323
Report No.(s): AD-A435064; No Copyright; Avail: CASI; A04, Hardcopy

During this past year, our research has focused on four objectives. The first objective was to develop a simulation model for the radiographic appearance of breast masses and calcifications. This model was verified by a human observer performance experiment. The next objective explored the physical properties of a digital mammographic system, including resolution, noise, efficiency, and lag. The system was characterized for new beam qualities that used a tungsten anode, as these beams appear to produce higher quality digital images than conventional molybdenum beams. The third objective included physical measurements of display characteristics. This study introduced new means of removing the structured noise from Liquid Crystal Display (LCD) and Cathode Ray Tube (ORT) devices. The results from this study were applied to the fourth objective, which examined the impact of display resolution on the detection of breast masses and calcifications. We used two different observer models to inspect these images, including JNDMetrix, a visual discrimination model, and a non-prewhitening matched filter model with an eye filter. The results from this study will be used to guide human observer studies. Future work will explore the impact of dose reduction, detector properties, and image processing on detection of masses and calcifications. DTIC

Digital Systems; Display Devices; Mammary Glands; Radiography

20050196173 Brigham and Women's Hospital, Boston, MA USA
BRCA1 Regulation of Fanconi Anemia Proteins in DNA Damage Repair
Park, Woo-Hyun; May 2005; 19 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0462
Report No.(s): AD-A435068; No Copyright; Avail: CASI; A03, Hardcopy

BRCAl is strongly associated with the breast cancer. BRCAl associates with numerous proteins that repair DNA damage. Fanconi Anemia (FA) is a rare autosomal recessive disorder. It has been shown that BRCAl regulates one of FA proteins, called FANCD2, by a process called ubiquitination. However, exactly how the FA proteins and BRCAl interact to regulate DNA damage repair obscure. In this project, we hypothesize that BRCAl ubiquitination of FANCD2 is affected by association with the FANCA protein complex and by association with DNA damage when embedded in chromatin. Specific aims are that (1) does BRCAl monoubiquitinate FANCD2 in vivo using purified ubiquitination factors? (2) Do embedding FA proteins in chromatin affect their function as ubiquitination substrates? (3) Is the ubiquitination of FA proteins by BRCAl affected by binding to damaged DNA? During the first year of grant, we purified the FANCD2, FANCA and BRCAl/BARDl from baculovirus-infected insect cells and we identified that BRCAl could ubiquitinated FAND2, dependent on the E2 enzymes. Also, we found direct DNA binding activity of the FANCD2 protein. Now we are trying to know the function of FANCD2 and modified FANCD2 (ubiquitinated FANCD2) on DNA or chromatin. Finally, we are trying to understand the relationship

between BRCAl and FANCD2 in the DNA damage repair pathway by keeping this project.
DTIC
Anemias; Breast; Cancer; Damage; Deoxyribonucleic Acid; Genes; Mammary Glands; Proteins

20050196174 Agency for Healthcare Research and Quality, Rockville, MD USA
Combining Performance Feedback and Evidence-Based Educational Resources
Meurer, John R.; Meurer, Linda N.; Grube, Jean; Brasel, Karen J.; McLaughlin, Chris; Hargarten, Stephen; Layde, Peter M.; Jan. 2005; 17 pp.; In English
Report No.(s): AD-A435070; No Copyright; Avail: Defense Technical Information Center (DTIC)

Objective: This study is intended to advance patient safety by demonstrating the effectiveness of coupling surveillance report performance feedback with evidence-based educational materials and other communications that help hospitals identify priorities and methods for medical injury prevention. Methods: Medical injury surveillance findings are reported semiannually to hospitals to support their quality improvement efforts. We developed educational manuals for five priority medical injury topics that covered indicator definitions, problem scope, interventions to prevent injuries, and evaluation methods. Bimonthly newsletters provide updates. Evaluation of 123 hospitals in a randomized controlled trial with structured surveys and medical injury surveillance is ongoing. Results: Preliminary results at 29 intervention hospitals suggest our approach resonates with stakeholders, has the general support of participating hospitals, addresses barriers to using information, and builds on existing competencies. Conclusions: While the impact of this medical injury prevention educational strategy requires further evaluation, the results may guide construction of performance reports, educational manuals, and newsletters to maximize the usefulness of patient safety information.
DTIC
Educational Resources; Feedback; Health; Hospitals; Injuries; Medical Services; Patients

20050196175 Agency for Healthcare Research and Quality, Rockville, MD USA
Medical Team Training Programs in Health Care
Baker, David P.; Gustafson, Sigrid; Beaubien, J. M.; Salas, Eduardo; Barach, Paul; Jan. 2005; 16 pp.; In English
Report No.(s): AD-A435072; No Copyright; Avail: Defense Technical Information Center (DTIC)

Numerous medical team training programs have been developed and implemented in response to the patient safety crisis highlighted by the Institute of Medicine. The role of effective teamwork in accomplishing complex tasks is well accepted in many domains. Similarly, there is some evidence that outcomes in health care may depend on effective team performance. This paper reviews the evidence base for two categories of medical team training: simulator-based programs and classroom-based programs. Specifically, we examine the purpose and strategy of each and then review the reported empirical evidence. In addition, for three of four classroom-based programs we report the results from a series of course observations, curriculum reviews, instructor interviews, and an independent assessment of participant reactions. Finally, on the basis of the evidence reviewed, we present a set of recommendations for how the health care community can develop medical team training in the future.
DTIC
Education; Health; Medical Personnel; Medical Services; Teams

20050196176 Agency for Healthcare Research and Quality, Rockville, MD USA
The University of Wisconsin-Madison Multidisciplinary Graduate Certificate in Patient Safety
Karsh, Ben-Tzion; Carayon, Pascale; Smith, Maureen; Skibinski, Kathleen; Thomadsen, Bruce; Brennan, Patricia F.; Murray, Mary E.; Jan. 2005; 14 pp.; In English
Report No.(s): AD-A435073; No Copyright; Avail: Defense Technical Information Center (DTIC)

A graduate-level certificate in patient safety has been developed at the University of Wisconsin-Madison (UW-Madison) as part of the university's AHRQ-funded Developmental Center for Evaluation and Research in Patient Safety, which is known as the Systems Engineering Initiative for Patient Safety (SEIPS). This patient safety certificate, which is open to all graduate students enrolled at UWMadison, combines course work from the departments of industrial engineering, population health sciences, and medical physics, as well as the school of pharmacy, school of nursing, and the law school. The course work covers the following areas: basic patient safety terms, concepts, and statistics; medical error causation; human error; tools to assess safety and risk; systems design principles; safety culture; measurement of risk; and analysis of safety and risk. It also covers technology used to improve patient safety, human factors engineering as applied to patient safety, finance/economics of patient safety, organizations involved in patient safety, medication use process and safety, implications of medication errors,

teamwork in health care, and medical error reporting. The patient safety certificate requires five courses, including three core patient safety courses, a patient safety practicum, and a patient safety guest lecture seminar. The practicum is designed to allow students to spend a semester at various health care organizations (hospital, outpatient clinic, long-term care facility, and home care), where individual students will participate in patient safety projects related to analysis, design, and/or implementation. DTIC

Clinical Medicine; Errors; Medical Services; Patients; Safety; Schools; Students

20050196177 Agency for Healthcare Research and Quality, Rockville, MD USA

Expediting Clinician Adoption of Safety Practices: The UCSF Venous Access Patient Safety Interdisciplinary Education Project

Donaldson, Nancy E.; Plank, Rosemary K.; Williamson, Ann; Pearl, Jeffrey; Kellogg, Jerry; Ryder, Marcia; Jan. 2005; 16 pp.; In English

Report No.(s): AD-A435074; No Copyright; Avail: Defense Technical Information Center (DTIC)

Objectives: The primary objective of the University of California, San Francisco (UCSF) Venous Access Device (VAD) Patient Safety Interdisciplinary Education Project was to develop a 30-hour/one clinical academic unit VAD patient safety course with the aim of expediting clinician adoption of critical concepts related to VAD-related patient safety. This paper describes the evolution of the interdisciplinary academic and continuing education courseware, and discusses the theoretical and technological underpinnings of the work. Methods: Following development of the academic course, the demand for derivative short versions was identified by clinician users and administrators based on evidence of (1) patient safety threats, such as air embolism associated with central line removal; (2) VAD competency deficits; and (3) wide variation in learner characteristics and needs. Results: Consideration for differing learning needs and time constraints of practicing clinicians led to the production of short versions of the core course, focusing on high-risk concepts related to VAD patient safety. Web-based courses using multiple media content presentation methodologies and addressing learner preferences are expected to facilitate learning, retention and transfer of the knowledge into practice. Conclusions: While the summative project evaluation is currently in progress, formative evaluation suggests the courseware is highly linked to key patient safety concerns related to VADs and that the core course, as well as the derivative short version of the content, may be institutionalized as a source of multidisciplinary clinical competency development, orientation, and training.

DTIC

Clinical Medicine; Education; Patients; Safety

20050196182 Pacific Health Research Inst., Honolulu, HI USA

Neurotoxins and Neurodegenerative Disorders in Japanese-American Men Living in Hawaii

Ross, G. W.; Apr. 2005; 10 pp.; In English

Contract(s)/Grant(s): DAMD17-98-1-8621

Report No.(s): AD-A435080; No Copyright; Avail: CASI; A02, Hardcopy

Pesticide exposure has been associated with increased Parkinson's disease (PD) risk. Results from the Honolulu-Asia Aging Study (HAAS) supported by this project showed PD risk doubled in individuals who worked on plantations over 20 years. Others have found high organochlorine levels in brains from decedents with PD relative to controls and dopaminergic neuron toxicity has been demonstrated in vitro but not proven in humans. This supplement aim was to measure organochlorine levels in all brains from the HAAS archive and to examine the association of brain organochlorine levels with numerous clinical and pathological endpoints obtained through prior and ongoing research. Frozen occipital blocks from 421 brains were sent to Dr. E.D. Pellizzari of Research Triangle Institute for organochlorine level assays. These are complete. Preliminary analyses demonstrate that a measurable a-chlordane level was significantly more frequently in brains with Lewy bodies (including PD cases) than in those without Lewy bodies (p=0.03). Additional analyses investigating relationships between brain organochlorine levels and substantia nigra neuron densities, striatal dopamine levels, brain glial fibrillary acidic protein levels, and cognitive ability are planned.

DTIC

Brain; Chlorine; Diseases; Human Beings; Japan; Males

20050196190 Wayne State Univ., Detroit, MI USA

Lipoxygenase, Angiogenicity, and Prostate Cancer Radioresistance

Nie, Dao-tai; Jan. 2005; 10 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0143

Report No.(s): AD-A435094; No Copyright; Avail: CASI; A02, Hardcopy

Prostate cancer (PCa) is one of most common cancers affecting American men. Radiotherapy is a prevalent modality for the treatment of prostate tumor. Although radiation is capable of eradicating localized prostate tumors, nearly 30% of patients treated with potentially curative doses relapse at the sites of irradiation. Therefore, there is an imperative need to improve the success rate of radiotherapy for PCa. This proposal is focused on a role of 1 2-lipoxygenase (LOX) in modulating the radiation response of PCa cells. 12-LOX, the enzyme of interest, has already been identified as a promoter for PCa growth and progression. In our studies, 12-LOX was found to promote the resistance of PCa cells to radiotherapy. Inhibition of 12-LOX was found to sensitize PCa cells to radiotherapy and this sensitization maybe due to the activation of caspase-3, suggesting 12-LOX as a novel target for radiosensitization. Further studies will allow us to evaluate 12-LOX as a target to develop radiosensitizer for PCa radiotherapy. The knowledge gained from proposed study will have significant impact on future radiotherapy for PCa.
DTIC
Cancer; Irradiation; Liquid Oxygen; Prostate Gland; Radiation Effects; Radiation Therapy

20050196191 New York Hospital-Cornell Medical Center, New York, NY USA
Comparative Analysis of Vitamin A (Retinol) Regulated Genes in African-American and Caucasian Prostate Cancer Patients
Touma, Sue E.; Gudas, Lorraine J.; Nanus, David M.; Tickoo, Satish K.; Mar. 2005; 8 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0056
Report No.(s): AD-A435095; No Copyright; Avail: CASI; A02, Hardcopy

Vitamin A (retinol) and its related metabolites like retinoic acid (RA) have great potential in their roles as prostate cancer chemopreventive and chemotherapeutic agents by exerting regulation on cell growth and differentiation. Several studies have shown that there is a reduction in retinoid levels and retinoid receptors (e.g. RAR(registered)2) in prostate cancer. RA is being used to treat patients with prostate cancer and has been shown to inhibit tumor growth and reverse the events of carcinogenesis in animal models of prostate cancer. There is a disparity in prostate cancer among the African-American population and we hypothesize that more severe disruptions of retinoid signaling occur, contributing to this disparity. The purpose of this study is to examine the underlying causes for the clinical behavior of prostate cancer in African-Americans as compared to Caucasian patients. Preliminary results by immunohistochemical analysis have shown the expression of LRAT, an enzyme responsible for retinol esterification and storage as retinyl esters, to be reduced in tumor tissue specimens from prostate cancer patients as compared to adjacent nonmalignant tissue. Understanding the role of retinoid signaling in prostate carcinogenesis will lead to improved chemoprevention strategies and to the development of novel therapies for this disease.
DTIC
Africa; Cancer; Gene Expression; Genes; Markers; Patients; Prostate Gland; Races (Anthropology); Retinene

20050196193 Pennsylvania Univ., Philadelphia, PA USA
Evaluation of Listeria monocytogenes Based Vaccines for HER-2/Neu in Mouse Transgenic Models of Breast Cancer
Singh, Reshma; Mar. 2005; 13 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0338
Report No.(s): AD-A435097; No Copyright; Avail: CASI; A03, Hardcopy

HER-2/neu is a member of the epidermal growth factor receptor family and is overexpressed in several cancers including breast, ovarian, and pancreatic cancers and is associated with poor prognosis. Patients with HER-2/neu overexpressing tumors are capable of mounting an immune response against their tumors, but this response is not enough to stop the growth and spread of the tumors. Our lab has developed Listeria monocytogenes as a vector to deliver cancer antigens to the host cell to elicit a tumor specific immune response. Overlapping fragments of rat HER. 2/neu have been expressed in recombinant Listeria monocytogenes. Using a transplantable tumor model developed for the FVB mouse, the five Lm- based HER-2/neu vaccines are being tested. Upon immunization with any of the vaccines, growth of established tumors is stopped and the size remains stable following 2 boosts. Tumors begin to decrease in size 3-4 weeks after the last boost and 40-50% of the mice regress their tumors. Each vaccine is capable of eliciting an anti-tumor response of the same magnitude as the vaccine containing the known T cell epitope, and this leads to the conclusion that there are multiple epitopes that have not been identified and work is beginning to map these epitopes.
DTIC
Antigens; Breast; Cancer; Mammary Glands; Mice; Vaccines

20050196194 Chicago Univ., Chicago, IL USA
Estrogen Receptor Alpha G525L Knock-In Mice
Sinkevicius, Kerstin W.; Mar. 2005; 12 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0347
Report No.(s): AD-A435099; No Copyright; Avail: CASI; A03, Hardcopy

We are developing a knock-in' mouse model with a mutation (glycine 525 to leucine, G525L) in estrogen receptor alpha (ERalpha) that permits exogenous regulation of its ligand-induced signaling pathways. This ligand-binding pocket mutation significantly reduces ERalpha response to endogenous estrogens but not to the synthetic nonsteroidal estrogen diethylstilbestrol (DES). Therefore, ERalpha signaling pathways can be turned on and off' in these mice through DES administration or withdrawal. To generate knock-in mice, an ERalpha construct containing the G525L mutation was engineered to facilitate homologous recombination into the mouse genome. The targeting construct was electroporated into ES cells, two positive clones were injected into mouse blastocysts, chimeras were generated, and germline transmission was established. Heterozygous mice were mated to produce litters of homozygous, heterozygous, and wild type mice. Genomic DNA from homozygous animals was sequenced and confirmed the G525L mutation was present. Reproductive tissues from 5 week old heterozygous and homozygous females were analyzed. Homozygous mice had immature and hypoplastic uterine tissue and mammary gland ductal trees. Homozygous ovaries were similar to those of heterozygous animals. Further analysis of this knock-in model will provide valuable information about the role of ERalpha in mammary gland development and carcinogenesis.
DTIC
Breast; Cancer; Estrogens; Mammary Glands; Mice

20050196195 New Mexico Univ., Albuquerque, NM USA
Treatment Strategies fir the NMDA Component of Organophosphorous Convulsions
Peterson, Steven; Apr. 2005; 83 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0794
Report No.(s): AD-A435100; No Copyright; Avail: CASI; A05, Hardcopy

The project evaluated anticonvulsant and neuroprotectant properties of novel medical countermeasures to lithium-pilocarpine-induced status epilepticus (SE)used here as a model of organophosphorus nerve agents. Although mefenamate induced modest anticonvulsant effects, survival was reduced and the SE-induced neuropathology was exacerbated. Nicotinamide induced only modest anticonvulsant and neuroprotectant activity at the doses tested. N-acetylcysteine was not anticonvulsant but enhanced both neurological deficit and neuropathology. PBN, but not S-PBN, induced significant neuroprotection. ACPC induced neuroprotection in temporal regions without anticonvulsant activity. D-cycloserine had no effect. Propofol induced significant neuroprotection and anticonvulsant activity in the rat model tested. It is recommended that PEN and ACPC be tested in multiple dose regimens for long term neuroprotection in nerve agent SE.
DTIC
Anticonvulsants; Convulsions; Lithium; Nerves; Organic Phosphorus Compounds; Pilocarpine

20050196196 Alabama Univ., Birmingham, AL USA
Mechanisms of p53-Mediated Apoptosis
McNaughton, Kelly L.; Mar. 2005; 25 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0349
Report No.(s): AD-A435101; No Copyright; Avail: CASI; A03, Hardcopy

The p53 tumor suppressor is the most commonly mutated gene in human breast cancer. Upon genotoxic stress, p53, a sequence-specific transcription factor, induces target genes that mediate many cellular activities such as cell cycle arrest and apoptosis. While the mechanism by which p53 induces apoptosis is unclear, this pathway has rich potential as a target for breast cancer therapies. Thus, the purpose of this proposal is to characterize the molecular basis of p53-mediated apoptosis by characterizing the transcriptional regulation of IGFBP3, a pro-apoptotic target gene, by p53 and by characterizing the role of IGFBP3 in p53-dependent apoptosis. To date, I have found that the N-terminal transcriptional activation domain 1 (AD1) and the C-terminal basic domain (BD) of p53 is inhibitory, while activation domain 2 (AD2) is required for transactivation of IGFBP3 by p53. Interestingly, lack of AD1 and the BD is paralleled in nature, and I found that the naturally occurring p53 isoforms activate the IGFBP3 promoter. Interestingly, inhibition of histone deacetylase activity restores the induction of IGFBP3 by full length p53. Since hi stone deacetylase (HDAC) inhibitors are currently undergoing clinical trials for cancer

therapies, my results shed insight into how HDAC inhibitors may be used as breast cancer therapies.
DTIC
Apoptosis; Breast; Cancer; Genes; Mammary Glands

20050196197 Washington Univ., Seattle, WA USA
In Vitro Assessment of a Peptide Nucleic Acid (PNA) - Peptide Conjugate Labeled With an Auger-Emitting Radionuclide for Prostate Cell Killing
Wilbur, Scott D.; Feb. 2005; 13 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0223
Report No.(s): AD-A435102; No Copyright; Avail: CASI; A03, Hardcopy

The ultimate goal of the research is to develop new treatment reagents for metastatic prostate cancer. Unfortunately, treatment of metastatic prostate cancer is problematic as the cells can become resistant to the therapy being used. Therefore, this exploratory research was directed at developing new therapy reagents that will not be affected by changes within cells. The therapy reagents use a radioactive material, Auger electron emitting radionuclides, to help solve the problem. Auger emission is quite different from emission from other radioactive materials as they have short-range electron emissions that are very toxic to cells and are not affected by other biological factors. Importantly, the very short particle range can greatly decrease the toxicity outside of the cells that it is targeted to. The studies focused primarily on the synthesis of a peptide nucleic acid (PNA) that has an Auger-emitter (1-125) incorporated. By design the PNA Will bind with mRNA and DNA associated with insulin-like growth factor receptor that is upregulated on PC-3 prostate cancer cells. The first objective was to obtain a thymine analog, an iodouracil-amino acid for incorporating into a PNA. This was accomplished in 8 synthetic steps. However, the tri-n-butylstannyluracil-amino acid required to couple with the PNA could not be prepared in the same manner. Therefore, a second synthetic route was undertaken which proved to be successful. The iodouracilamino acid derivative and tri-n-butylstannyluracil amino acid derivative were coupled with a free amine on the PNA to form new PNA molecules (iodouracil conjugate was used as standard for radioiodinated derivative). The stannyl-PNA was readily radioiodinated to give the desired 125\iodo-PNA. To obtain selective targeting to PC-3 prostate cancer cells and cause internalization of the PNA, the peptide bombesin was coupled to the PNA. Because the PNA have very low solubility in water, a polyethyleneglycol (PEG) linker was used.
DTIC
Cancer; Conjugates; In Vitro Methods and Tests; Nucleic Acids; Peptides; Prostate Gland; Radiation Therapy; Radioactive Isotopes; Therapy; Toxicity

20050196207 Scripps Research Inst., La Jolla, CA USA
Blocking Blood Supply to Breast Carcinoma With a DNA Vaccine Encoding VEGF Receptor-2
Xiang, Rong; Apr. 2005; 58 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0562
Report No.(s): AD-A435113; No Copyright; Avail: CASI; A04, Hardcopy

Our major tasks in this last grant year focused on gaining insights into CTL-mediated immune mechanisms induced by FLK-1 whole gene and minigene-based DNA vaccines against breast tumors. We also extended our efforts to a new area of breast cancer research by targeting the transcription factor Fos-related antigen 1(Fra-1), overexpressed by breast carcinoma. As mentioned in last year's progress report, we extended the last grant period by one more year because of these additional exciting and novel findings. We report for the first time on the anti-breast carcinoma activity of antiangiogenic DNA minigene vaccines and identify the first H-2 Db-restricted FLK-1 epitope-FLK400 (VILTNPISM). Importantly, the pHI-Db and pHI-FLK400 minigene vaccines achieved similar efficacy as the DNA vaccine encoding the full length FLK-1 gene. They present a much simpler and more manipulatable alternative to the whole gene vaccine and add a new dimension to anti-angiogenic interventions in breast cancer. In addition, we also demonstrated that immunization with a DNA vaccine encoding murine Fra-I, co-transformed with a gene encoding secretory murine cytokine IL-i 8, can effectively eradicate two different breast cancers, 4T1 and D2F2 in syngeneic mouse models and generate a long-lived specific tumor-protective immune response.
DTIC
Angiogenesis; Blocking; Blood Volume; Breast; Cancer; Coding; Deoxyribonucleic Acid; Mammary Glands; Vaccines

20050196209 North Carolina Univ., Chapel Hill, NC USA

Determining the Effect of Cryptochrome Loss and Circadian Clock Disruption on Tumorigenesis in Mice

Gauger, Michele A.; Mar. 2005; 8 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0387

Report No.(s): AD-A435115; No Copyright; Avail: CASI; A02, Hardcopy

It has recently been reported that disruption of the circadian clock leads to increased breast cancer risk in humans and to a high rate of ionizing radiation (IR)-induced tumors in mice. Cryptochrome 1 and 2 proteins are core components of the mammalian circadian clock and mice mutated in both genes are arrhythmic. We tested Cry1-/-Cry2-/- mice and fibroblasts derived from these mice for radiation induced cancer and killing, and DNA damage checkpoint and killing, respectively. We find that the arrhythmic mice and fibroblasts are indistinguishable from wild-type controls with respect to their radiation-induced morbidity and mortality. We also find that upregulation of the cell cycle kinase Weel in the absence of Cryptochromes does not affect the DNA damage checkpoint and that c-Myc regulation is normal in the absence of Cryptochromes. Our data suggest that the disruption of the circadian clock per se does not predispose mice to cancer. It appears that the core clock proteins may participate in DNA damage checkpoints in manners unique to each core clock protein and as a consequence circadian disruption may or may not predispose mice to cancer depending on the specific mechanism of disruption.

DTIC

Breast; Cancer; Circadian Rhythms; Clocks; Losses; Mammary Glands; Mice

20050196211 Air Force Academy, CO USA

The Worried Well: Strategies for Installation Commanders

Pilch, Fran; Jan. 2005; 73 pp.; In English

Report No.(s): AD-A435117; No Copyright; Avail: Defense Technical Information Center (DTIC)

The question concerning the most effective strategies that should be employed by base commanders to mitigate problems involving the worried well in the event of a biological weapons attack is important and critical. The anthrax crisis following on the heels of the devastating terrorist attacks of September 11, 2001, drew attention to the very real possibility of the use of biological weapons by terrorist or criminal elements seeking to disrupt society. The discovery of attempts to produce lethal amounts of ricin in London in 2002 added to these fears. The fact that not all of the biological agents developed in the former Soviet Union are accounted for also presents great cause for concern; added to this concern is the fear that scientists who once worked in the Soviet biological weapons program may be vulnerable to exploitation and co-option. Considering the very weak inspection framework of the Biological Weapons Convention it is difficult if not impossible to determine the extent to which additional states are pursuing active biological weapons development.

DTIC

Emergencies; Installing; Management Methods; Responses

20050196213 Monash Univ., Clayton, Australia

Role of Tumor Stroma in Prostate Carcinogenesis

Taylor, Renea J.; Mar. 2005; 13 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0047

Report No.(s): AD-A435121; No Copyright; Avail: CASI; A03, Hardcopy

This project ultimately aims to identify the role of tumor stroma in inducing prostate carcinogenesis. The hypothesis to be tested is that tumor stroma, in the form of carcinoma-associated fibroblasts (CAFs) isolated from human prostate cancer patients, can initiate malignant transformation in human embryonic stem cells. To date, we have made significant progress towards generating prostatic fibroblast/human embryonic stem cell tissue recombinants. We have taken some time to get ethics approval for the collection of human prostate tissues and subsequent recruitment of patients in collaboration with clinicians. Upon collection of prostate tissues, we have successfully isolated and cultured prostatic fibroblasts. We are currently refining our collection technique to be 100% confident that the fibroblasts we collect are of a malignant phenotype before we claim to have isolated 'carcinoma-associated fibroblasts (CAFs)'. Meanwhile, we have established the culture of human embryonic stem cells. Importantly, we have gained access to constitutively expressing-GFP human embryonic stem cells for use in tissue recombination experiments. Using these cells, we have generated a number of tissue recombinants that are currently grafted under the kidney capsule of immune-deficient mice. The first round of grafts are due to he harvested in April 2005. Whatever the outcome of these experiments is, we are sure to contribute significantly to our understanding of the role of tumor stroma in the process of prostate carcinogenesis.

DTIC

Cancer; Carcinogens; Fibroblasts; Prostate Gland; Stem Cells; Tumors

20050196214 Texas Univ., Houston, TX USA
Regulation of Calcium Fluxes and Apoptosis by BCL-2 Family Proteins in Prostate Cancer Cells
McConkey, David J.; Feb. 2005; 87 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0182
Report No.(s): AD-A435122; No Copyright; Avail: CASI; A05, Hardcopy

Members of the BCL-2 family of cell death regulators play critical roles in the progression of androgen-independent, metastatic prostate cancer. Despite years of research, the molecular mechanisms underlying the effects of these proteins remain unclear. In previous studies we demonstrated that BCL-2 family proteins regulate a crucial step in the apoptotic pathway (cytochrome c release) by regulating endoplasmic reticular and mitochondrial calcium fluxes. In this project we are studying these effects in more detail, focusing on the possibility that the so-called 'BH3 only' proteins and Bax directly promote endoplasmic reticular calcium release. To this end, we are (1) Defining the effects of mitochondrial calcium uptake on cytochrome c mobilization and release; (2) Determining the effects of BH3 only members of the BCL-2 family on intracellular calcium fluxes; and (3) Identifying possible direct effects of Bax and Bak on ER calcium fluxes. With this information in hand, we expect that we will be able to define therapeutic strategies that directly target the cell death resistance mechanisms that appear to limit the effects of currently available therapies.
DTIC
Apoptosis; Calcium; Cancer; Prostate Gland; Proteins

20050196220 Industrial Coll. of the Armed Forces, Washington, DC USA
Industry Studies 2004: Biotechnology
Goldberg, Joseph E.; Dorsey, Harry; Bartone, Paul; Ortman, Bill; Ashcraft, Paul; Burlingame, Stan; Carter, Anna L.; Cofer, Robin D.; Elwood, John; Guerts, Jim; Jan. 2004; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435135; No Copyright; Avail: Defense Technical Information Center (DTIC)

The USA is the world leader in all aspects of the biotechnology industry and biotechnology is quickly becoming a major industrial player in the USA and globally. The biotech arena touches multiple facets of a number of industries: medicine, agriculture, aquaculture, forestry, defense, and others. Biotechnology is still an immature industry that has yet to reach its potential, but will likely have an impact on almost every aspect of the U.S. economy and way of life in the future. With the mapping of the human genome, medical discoveries occur daily -- pure science, new medicines, and genetically enhanced products designed to save lives. Biotech agriculture is a possible solution in the face of increasing global population to food shortages that will not be met by the 'Green Revolution' of the past century. Biotechnology holds promise for a cleaner environment through genetically engineered plants and targeted bioremediation. Biotechnology is greatly affected by government investment in basic science, regulation, and product approval processes, which drives a unique business model. While the USA is the world leader, international competitors are gaining ground. Biomedical technologies have the potential to relieve human suffering and solve a range of societal problems. However, some of these technologies are controversial, such as stem cell research and cloning, and raise ethical, moral, and social issues. Potential dual use of biotechnology complicates the effort to craft effective non-proliferation policies and mitigate bio-weapons threats. Biotechnology has the potential to revolutionize all aspects of U.S. daily life over the next two decades, in much the same way information technology did during the previous two decades.
DTIC
Biotechnology; Economics; Forecasting; Government Procurement; Industries; Policies; Regulations

20050196223 Industrial Coll. of the Armed Forces, Washington, DC USA
Health Care: A Report on the Industry 2004
Knowlton, William; Palma, Carole; Browning, James; Allison, Lynn; Bellacicco, Brian; Blackman, Brenda; Demps, Roderick; Frisk, Joseph; Furuta-Toy, Julie; Hamilton, Ronald; Jun. 2004; 45 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435140; No Copyright; Avail: CASI; A03, Hardcopy

The quality of health care in the USA is not commensurate with its cost. Americans pay more per capita for health care than citizens of any other country in the world, yet population health trails that of developed nations that spend far less. Moreover, an astounding 15% of Americans lack health care coverage. Although some argue that the USA can claim a quality of health care among the highest in the world, costs in fact are soaring out of proportion to the quality of care provided to the population as a whole. Market failures prevent the health care industry from reaching its best potential efficiency in terms of resource allocation. Government and private industry spending on health care threatens an impending national fiscal crisis as Americans age but live longer with chronic diseases while engaging in unhealthy lifestyles that cause problems such as obesity. The USA must control costs while ensuring broad access to high-quality care. Without conceptual unity among

Americans regarding fundamental health care values and objectives, health care costs will likely continue to grow out of proportion to the quality of and access to care provided to the population as a whole. Development now of a National Health Strategy provides the best chance to produce the needed fundamental change in time to avert approaching fiscal disaster.
DTIC
Costs; Economics; Forecasting; Health; Industries; Medical Services; Policies; Quality; United States

20050196224 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Efficacy of FDA-Approved Hemostatic Drugs to Improve Survival and Reduce Bleeding in Rat Models of Uncontrolled Hemorrhage
Ryan, Kathy L.; Cortez, Douglas S.; Dick, Edward J., Jr.; Pusateri, Anthony; Jul. 2005; 35 pp.; In English
Report No.(s): AD-A435141; USAISR-2005-03; No Copyright; Avail: CASI; A03, Hardcopy

Several FDA-approved intravenous drugs are used to reduce surgical bleeding. This series of studies tested whether these drugs (aprotinin, desmopressin, tranexamic acid, e-aminocaproic acid) could reduce bleeding due to traumatic injuries in two models of uncontrolled hemorrhage in rats. In the first phase of each study, a lethal liver injury was produced by excising a section of the median lobe (approximately 0.8% of body weight) and an infusion of either vehicle or the test substance was immediately begun. This model included aggressive fluid resuscitation and a severe dilutional coagulopathy. Blood loss, survival time and mortality rate were measured. Three studies were performed, testing each of the drugs singly and in combination. None of the drugs significantly reduced either bleeding time or blood loss in the tail bleeding model, nor were blood loss, survival time or mortality rate altered in the liver injury model. Taken together, these results suggest that these FDA-approved drugs, when used either singly or in combination. are not efficacious in these models of traumatic uncontrolled hemorrhage.
DTIC
Blood Coagulation; Drugs; Fluids; Hemorrhages; Injuries; Rats; Shock (Physiology); Survival

20050196226 Fox Chase Cancer Center, Philadelphia, PA USA
MR Imaging Based Treatment Planning for Radiotherapy of Prostate Cancer
Chen, Lili; Feb. 2005; 37 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0023
Report No.(s): AD-A435143; No Copyright; Avail: CASI; A03, Hardcopy

This work is aimed at MRI-based treatment planning for radiation therapy. The tasks for the first year include (a) quantify the effect of MRI distortion on target delineation and treatment planning dose calculation; (b) validate and improve gradient distortion correction for MRI-based treatment planning, (c) investigate the effect of intra-fraction prostate motion and (d) investigate the accuracy of a stereotactic body frame for patient immobilization. We have confirmed that treatment planning dose calculations using MRI- derived homogenous geometry are adequate for patient sizes within 38 cm using the GDC software. We have investigated the effect of MRI residual distortion after GDC on IMRT treatment planning and dosimetry accuracy. Our results showed that the residual distortion errors are \h 1 cm, which will have a negligible clinical effect for\g 90% of the prostate patients whose lateral dimensions are \h40 cm. We have validated the residual distortions and developed computer software to reduce them using point-by point corrections for large patients (up to 42 cm). We have performed studies on the effect of intra-fraction prostate motion using MR cine images and we also have been evaluating the accuracy of a stereotactic body frame for patient immobilization using MRI.
DTIC
Cancer; Computer Programs; Imaging Techniques; Magnetic Resonance; Prostate Gland; Radiation Therapy

20050196227 State Univ. of New York, Albany, NY USA
Use of a Novel, Stable Gene Silencing Technology to Determine the Contribution of the Receptor Tyrosine Kinase to the Breast Cancer Phenotype
Conklin, Douglas S.; Oct. 2004; 11 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0729
Report No.(s): AD-A435144; No Copyright; Avail: CASI; A03, Hardcopy

An enormous amount of evidence has implicated members of the receptor protein tyrosine kinase (RPTK) family in many types of cancer. We have developed an extraordinarily powerful technique that uses small, DNA-encoded RNAs to suppress the expression of a desired gene in mammalian cells. For this project, short hairpin RNAs targeting each of the 58 human receptor protein tyrosine kinases will be created, introduced into MCF-7 cells and tested for effects on tumorigenicity in vivo

and in vitro. At the end of the initial twelve months of the project there has been good progress. The goal of year one was to create a set of encoded hairpins targeted against the genomic complement of RPTKs. This goal has been met. By adopting high-throughput approaches to the construction of hairpins we have created a set of silencing agents not only for the genomic complement of receptor tyrosine kinases, but also all tyrosine kinases and a large number of genes functionally related to the RPTKs. Other developments include the use of shRNAs in the production of transgenic animals and microarray-based shRNA delivery for phenotypic screening. Both of these are potentially useful in future studies of the tyrosine kinase targeting constructs.
DTIC
Breast; Cancer; Enzymes; Genes; Mammary Glands; Phenotype; Phosphorus; Tyrosine

20050196228 National Rehabilitation Hospital, Washington, DC USA
NRH Neuroscience Research Center
Healton, Edward B.; Jun. 2004; 91 pp.; In English
Contract(s)/Grant(s): DAMD17-02-2-0032
Report No.(s): AD-A435145; No Copyright; Avail: CASI; A05, Hardcopy

The NRH Neuroscience Research Center (NRC) mission is to promote and accomplish rehabilitation- related basic and applied neuroscience research. As part of this mission, the NRC: (1) develops new clinical interventions for patients with neurologically based impairments, (2) evaluates the effectiveness of new and existing rehabilitation-related interventions, (3) enhances our understanding of the neurophysiological and neuropsychological basis of impairment and disability, and (4) develops new methods to assess human function and performance. In order to be successful with our mission, the NRC is comprised of five research areas. They are as follows: a) High Resolution and Neuromotor Assessment; b) Mechanisms Underlying Recovery from Neurological Illness and Injury; c) Treatment of Neurological Diseases and Injury; d) Pilot Projects; and e) Annual Conference and Expert Panel Projects. Year 2 progress is discussed in detail in this report.
DTIC
Diseases; Nervous System; Neurology

20050196233 Army Research Inst. of Environmental Medicine, Natick, MA USA
Human Water Needs
Sawka, Michael N.; Cheuvront, Samuel N.; Carter, Robert, III; Jun. 2005; 11 pp.; In English
Report No.(s): AD-A435156; MISC-04-23; No Copyright; Avail: Defense Technical Information Center (DTIC)

Healthy humans regulate daily water balance remarkably well across their lifespan despite changes in biological development and exposure to stressors or hydration status. Acute or chronic body water deficits result when intakes are reduced or losses increase, but day-to-day hydration is generally well maintained so long as food and fluid are readily available. Total water intake incluces drinking water, water in beverages, and water in food. Daily water needs determined from fluid balance, water turnover, or consumption studies provide similar values for a given set of conditions. A daily water intake of 3. 7 L for adult men and 2.7 L for adult women meets the needs of the vast majority of persons. However, strenuous physical exercise and heat stress can greatly increase daily water needs, and the individual variability between athletes can be substantial.
DTIC
Potable Water; Water

20050196245 Naval Health Research Center, San Diego, CA USA
Department of Defense Birth and Infant Health Registry: Annual Report on Birth Defects Among Infants Born to U.S. Military Families, January 1, 2000 Through December 31, 2000
Ryan, Margaret A.; Honner, William K.; Rudy-Goodness, Cheryl M.; Chow, Shirley C.; Conlin, Ava Marie S.; Reed, Robert J.; Smith, Tyler C.; Stiegman, Victor K.; Mar. 2005; 26 pp.; In English
Report No.(s): AD-A435183; NHRC-05-08; No Copyright; Avail: Defense Technical Information Center (DTIC)

The US Department of Defense (DoD) is challenged with monitoring and protecting the health and well-being of its service members. The growing number of women on active duty and the diverse hazardous exposures associated with military service make reproductive health issues a special concern. To address this concern, the DoD Birth and Infant Health Registry was established at the DoD Center for Deployment Health Research, located at the Naval Health Research Center in San Diego, California. The DoD Birth and Infant Health Registry captures comprehensive data on healthcare utilization to calculate the prevalence of birth defects among children born to military families. Population-based electronic surveillance is

supplemented by active case validation efforts. In 2000, the DoD Birth and Infant Health Registry captured data on the 95,704 livebirths that occurred in US military families worldwide. This report presents detailed data on these infants using nationally standardized definitions for major congenital anomalies diagnosed before 1 year of age. These results complement civilian public health surveillance efforts and may be especially valuable to military members and their families.
DTIC
Birth; Congenital Anomalies; Defects; Defense Program; Health; Military Personnel

20050196280 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Yersinia pestis Yop Secretion Portein F: Purification, Characterization, and Protective Efficacy Against Bubonic Plague
Swietnicki, Wieslaw; Powell, Bradford S.; Goodin, Jeremy; Mar. 2005; 8 pp.; In English
Report No.(s): AD-A435272; RPP-04-474; No Copyright; Avail: Defense Technical Information Center (DTIC)

Yersinia pestis is a gram-negative human pathogen that uses a type III secretion system to deliver virulence factors into human hosts. The delivery is contact-dependent and it has been proposed that polymerization of Yop secretion protein F (YscF) is used to puncture mammalian cell membranes to facilitate delivery of Yersinia outer protein effectors into host cells. To evaluate the potential immunogenicity and protective efficacy of YscF against Y. pestis, we used a purified recombinant YscF protein as a potential vaccine candidate in a mouse subcutaneous infection model. YscF was expressed and purified from Escherichia coli by immobilized metal-ion affinity chromatography and protein identity was confirmed by ion trap mass spectrometry. The recombinant protein was highly alpha-helical and formed relatively stable aggregates under physiological conditions. The properties were consistent with behavior expected for the native YscF, suggesting that the antigen was properly folded. Ten mice were inoculated subcutaneously, administered booster injections after one month, and challenged with 130 LD(50) of wild type Y. pestis CO92. Six animals in the vaccinated group but none in the control group survived the challenge. The vaccinated animals produced high levels of specific antibodies against YscF as determined by Western blot. The data were statistically significant (P=0.053 by two-tailed Fisher's test), suggesting that the YscF protein can provide a protective immune response against lethal plague challenge during subcutaneous plague infection.
DTIC
Characterization; Purification; Secretions

20050196284 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Hypoxia-Inducible Factor Prolyl Hydroxylases are Oxygen Sensors in the Brain
Dalgard, Clifton; Mar. 2005; 126 pp.; In English
Report No.(s): AD-A435415; No Copyright; Avail: Defense Technical Information Center (DTIC)

In mammalian cells, molecular oxygen is a requirement for normal growth, metabolism, and survival. Tissues in which oxygen demand surpasses oxygen supply become hypoxic and cannot maintain normal function. Thus, the ability to sense oxygen levels is necessary for an organism to survive and thrive in changing environmental and physiological conditions. HIF-1 is a transcription factor complex that is essential and central to several cellular and systemic adaptations to hypoxia. For example, vascular endothelial growth factor and erythropoietin are HIF-1 target genes that are important in angiogenesis and erythropoiesis, respectively. HIF-1 consists of two subunits, alpha and beta, and control of HIF-1 function is accomplished through the hydroxylation of proline residues and an asparagine residue on the -subunit of HIF-1. Under normoxic conditions, hydroxylated HIF-1 is constantly and rapidly degraded, thus HIF-1 is inactivated. Additionally, undegraded HIF-1 is hydroxylated at an asparagine residue in the c-terminal region, which prevents it from binding to the co-transcriptional activator p300.
DTIC
Brain; Gas Detectors; Hypoxia; Oxygen

20050196285 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Genomic Diversity of Burkholderia pseudomallei Clinical Isolates: Subtractive Hybridization Reveals a Burkholderia mallei-Specific Propage in B. pseudomallei 1026b
DeShazer, David; Jun. 2004; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-02-4-5X-026
Report No.(s): AD-A435423; RPP-04-214; No Copyright; Avail: Defense Technical Information Center (DTIC)

Burkholderia pseudomallei is the etiologic agent of the disease melioidosis and is a category B biological threat agent. The genomic sequence of B. pseudomallei K96243 was recently determined, but little is known about the overall genetic diversity of this species. Suppression subtractive hybridization was employed to assess the genetic variability between two

distinct clinical isolates of B. pseudomallei, 1026b and K96243. Numerous mobile genetic elements, including a temperate bacteriophage designated phi1026b, were identified among the 1026b-specific suppression subtractive hybridization products. Bacteriophage phi1026b was spontaneously produced by 1026b, and it had a restricted host range, infecting only Burkholderia mallei. It possessed a noncontractile tail, an isometric head, and a linear 54,865-bp genome. The mosaic nature of the phi1026b genome was revealed by comparison with bacteriophage phiE125, a B. mallei-specific bacteriophage produced by Burkholderia thailandensis. The phi1026b genes for DNA packaging, tail morphogenesis, host lysis, integration, and DNA replication were nearly identical to the corresponding genes in phiE125. On the other hand, phi1026b genes involved in head morphogenesis were similar to head morphogenesis genes encoded by Pseudomonas putida and Pseudomonas aeruginosa bacteriophages. Consistent with this observation, immunogold electron microscopy demonstrated that polyclonal antiserum against phiE125 reacted with the tail of phi1026b but not with the head. The results presented here suggest that B. pseudomallei strains are genetically heterogeneous and that bacteriophages are major contributors to the genomic diversity of this species. The bacteriophage characterized in this study may be a useful diagnostic tool for differentiating B. pseudomallei and B. mallei, two closely related biological threat agents.
DTIC
Bacillus; Bacteria; Bacteriophages; Genetics; Genome

20050196545 Northrop Grumman Information Technology, Inc., San Antonio, TX, USA, Conceptual MindWorks, Inc., San Antonio, TX, USA
Prospective Evaluation of Mesopic Night Vision and Night Vision Goggle Visual Acuity After Photorefractive Keratectomy (PRK)
Miller, Robert E., II; Thompson, William T.; Baldwin, J. B.; Ivan, Douglas J.; Tutt, Ronald C.; Hiers, Paul L.; Mar. 2005; 49 pp.; In English
Report No.(s): AD-A435075; SAM-FE-BR-TR-2005-0001; No Copyright; Avail: CASI; A03, Hardcopy

The US Air Force PRK Study involved 98 non-flying, active duty volunteer personnel. All study subjects underwent a comprehensive array of vision tests. Baseline and post-operative data were collected at the Ophthalmology Branch of the Clinical Sciences Division of the USAF School of Aerospace Medicine, in partnership with the Air Force Research Laboratory and Wilford Hall Medical Center. This report covers results from pre- and post-operative night vision goggle (NVG) visual acuity testing. 65 treated subjects and 15 untreated controls completed all post-op visits through 12 months, and 52 treated subjects and 14 untreated controls through 24 months. NVG acuities were collected on a high contrast letter chart (Bailey-Lovie), and custom made grating charts. There was a statistically significant loss of letter acuity at the 4- and 6-month post-op visits for treated subjects but not controls. Acuity returned to baseline levels by 12 months. Mean loss of acuity for groups was typically only a few letters; however, treated subjects were more likely to lose than gain acuity beyond that predicted from repeatability studies with controls.
DTIC
Eye (Anatomy); Goggles; Night Vision; Refractivity; Surgery; Visual Acuity

20050196575 Massachusetts General Hospital, Boston, MA USA
A Prospective Randomized Clinical Trial of Celecoxib for the Control of Symptomatic Plexiform Neurofibroma in Neurofibromatosis 1
Gusella, James F.; Plotkin, Scott; Feb. 2005; 6 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0119
Report No.(s): AD-A434638; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of the project was to develop the infrastructure necessary to run a multi-center clinical trial of a novel medical therapy for patient with NF1. To this end, a consortium of seven institutions was developed, each with expertise in treating patients with NF1 or tumors of the nervous system. Important accomplishments include the establishment of a clinical protocol for running the trial; naming a Steering Committee, Data and Safety Monitoring Board, and Medical Monitor; and partnering with Pfizer, Inc, and PharmaContent, Inc. to run the trial. The protocol was submitted for approval at the Institutional Review Board at the sponsoring institution. This work culminated in the submission of a application for a Clinical Trial Award through the Department of Defense in June, 2005 (month 6 of the grant period).
DTIC
Nervous System; Tumors; Patients

52
AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20050192556 OMNI Corp., Oklahoma City, OK, USA, Civil Aerospace Medical Inst., Oklahoma City, OK, USA
2003 Employee Attitude Survey: Analysis of Employee Comments
King, S. Janine; Cruz, Crystal E.; Jack, Dan G.; Thomas, Suzanne; Hackworth, Carla A.; June 2005; 40 pp.; In English
Contract(s)/Grant(s): FAA-AM-B-03-HRR-522
Report No.(s): DOT/FAA/AM-2005/13; No Copyright; Avail: CASI; A03, Hardcopy

The Federal Aviation Administration (FAA) distributed 48,900 Employee Attitude Surveys to is employees in September 2003; of those, 22,720 completed surveys were returned. About 38% (8,606) of the returned surveys contained typed or hand-written comments. A 33% random sample of commented surveys (2,860 surveys) across FAA lines of business and major organizations was selected for transcription and content coding. Of the total codes assigned, 12,703 (91%) were considered negative in tone, and 1,193 (9%) were considered negative in tone, and 1,193 (9%) were positive. Comment categories (i.e., combined topics) and topics were chosen for presentation by rank-ordering codes for positive and negative comment categories/topics. The top 50% of positive comments included four categories/topics: confidence in leadership, satisfaction with job overall, commitment/loyality to the FAA, and confidence in nonsupervisory employees. The top 50% of negative comments included 20 categories/topics. Of these, the categories/topics representing the highest proportion of negative comments were: confidence in leadership; morale; privatization/future contracting; understaffing; FAA policies, practices, and programs; encouraging hard work; management concern for employees; promotion equity; comments about the survey; and trust. The high number of negative comments included in this report should not compel the reader to conclude that employees were extremely dissatisfied overall. In fact, the quantitative reports of response frequencies to the closed-ended items on the survey revealed a variety of areas where most employees were satisfied. For a balanced view of employee feedback, consider the results from the quantitative reports along with employee comments from the survey.
Author
Human Behavior; Surveys; Employee Relations; Commerce

20050195933 Air Force Research Lab., Brooks AFB, TX USA
Scheduling Aircrews 1: Intra-Theater 24/7 Operations
Miller, James C.; May 2005; 27 pp.; In English
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A434696; AFRL-HE-BR-TR-2005-0074; No Copyright; Avail: CASI; A03, Hardcopy

Aircrew fatigue problems existed in 24/7, intra-theater, tactical airlift operations. One reason for the high levels of fatigue was the irregularity of the schedule for a given crew across days. A rotating schedule approach was recommended: slow rotation if adequate day-sleep facilities are available; otherwise, rapid rotation schedule to minimize exposure to inherently debilitating night work. Seven scheduling principles were applied including a normal, maximum crew duty period of 14 hours, and scheduling an aircrew such that their show time does not differ more than +/- 1 hour on successive days. Five scheduling concepts were used to produce examples of one slowly-rotating schedule and one rapidly-rotating schedule.
DTIC
Flight Crews; Scheduling

20050196074 Army Research Inst. of Environmental Medicine, Natick, MA USA
Ranger and Airborne School Students' Heat Acclimatization Guide
Sawka, M. N.; Kolka, M. A.; Montain, S. J.; Jan. 2003; 6 pp.; In English
Report No.(s): AD-A434919; MISC-05-19; No Copyright; Avail: Defense Technical Information Center (DTIC)

Guide for elite soldiers who will be attending strenuous advanced military training in hot weather. It provides practical guidance to obtain optimal health acclimatization to both maximize performance and minimize the risk of becoming a heat casualty.
DTIC
Heat Acclimatization; Schools; Students

20050196192 Boston Univ., Boston, MA USA

A Re-Examination of Neuropsychological Functioning in Persian Gulf War Era Veterans

White, Roberta F.; Aug. 2003; 126 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0063

Report No.(s): AD-A435096; No Copyright; Avail: CASI; A07, Hardcopy

The specific aims of this project were 1) to determine whether objective test measures reveal any progressive diminution in cognitive function among the GW-era veterans who participate in the study in 1995-1998 (Time 1) by comparing test performance observed initially to performance 4-5 years later and 2) to determine whether any identifiable declines in function are related to exposures experienced during deployment to the Gulf, post-traumatic stress disorder, major depressive disorder, or existence of multiple health complaints. Participants were deployed and non-deployed GW-era veterans who were tested at Time 1. The GW-deployed group included patients initially referred for clinical neuropsychological evaluations and a group of individuals seeking treatment or diagnostic evaluation for any purpose. Controls were treatment-seeking non deployed GW-era veterans studied between 1995-1998. The prior finding of differences between the deployed and non-deployed treatment seeking GW-era veterans in neuropsychological outcomes was not supported by the Time 2 data. This may reflect spurious findings at Time 1 or selection bias in the non-deployed group (high rates of major depression). The deployed veteran group did not perform worse at Time 2 than Time 1 suggesting that there was no progressive cognitive decline associated with GW deployment.

DTIC

Neurology; Persian Gulf; Psychology; Warfare

20050196720 NASA Johnson Space Center, Houston, TX, USA, Wyle Labs., Inc., Houston, TX, USA, Universities Space Research Association, Houston, TX, USA

Managing Lunar and Mars Mission Radiation Risks, Part 1, Cancer Risks, Uncertainties, and Shielding Effectiveness

Cucinotta, Francis A.; Kim, Myung-Hee Y.; Ren, Lei; July 2005; 44 pp.; In English

Report No.(s): NASA/TP-2005-213164/PT1; S-960/PT1; No Copyright; Avail: CASI; A03, Hardcopy

This document addresses calculations of probability distribution functions (PDFs) representing uncertainties in projecting fatal cancer risk from galactic cosmic rays (GCR) and solar particle events (SPEs). PDFs are used to test the effectiveness of potential radiation shielding approaches. Monte-Carlo techniques are used to propagate uncertainties in risk coefficients determined from epidemiology data, dose and dose-rate reduction factors, quality factors, and physics models of radiation environments. Competing mortality risks and functional correlations in radiation quality factor uncertainties are treated in the calculations. The cancer risk uncertainty is about four-fold for lunar and Mars mission risk projections. For short-stay lunar missins (\h180 d), SPEs present the most significant risk, but one effectively mitigated by shielding. For long-duration (\g180 d) lunar or Mars missions, GCR risks may exceed radiation risk limits. While shielding materials are marginally effective in reducing GCR cancer risks because of the penetrating nature of GCR and secondary radiation produced in tissue by relativisitc particles, polyethylene or carbon composite shielding cannot be shown to significantly reduce risk compared to aluminum shielding. Therefore, improving our knowledge of space radiobiology to narrow uncertainties that lead to wide PDFs is the best approach to ensure radiation protection goals are met for space exploration.

Author

Bioastronautics; Radiobiology; Radiation Dosage; Probability Distribution Functions; Cancer; Radiation Hazards; Astronauts

20050196819 NASA Langley Research Center, Hampton, VA, USA

Recreation Embedded State Tuning for Optimal Readiness and Effectiveness (RESTORE)

Pope, Alan T.; Prinzel, Lawrence J., III; [2005]; 10 pp.; In English; 11th International Conference on Human-Computer Interaction, 22-27 Jul. 2005, Las Vegas, NV, USA

Contract(s)/Grant(s): 23-063-40-00; No Copyright; Avail: CASI; A02, Hardcopy

Physiological self-regulation training is a behavioral medicine intervention that has demonstrated capability to improve psychophysiological coping responses to stressful experiences and to foster optimal behavioral and cognitive performance. Once developed, these psychophysiological skills require regular practice for maintenance. A concomitant benefit of these physiologically monitored practice sessions is the opportunity to track crew psychophysiological responses to the challenges of the practice task in order to detect shifts in adaptability that may foretell performance degradation. Long-duration missions will include crew recreation periods that will afford physiological self-regulation training opportunities. However, to promote adherence to the regimen, the practice experience that occupies their recreation time must be perceived by the crew as engaging and entertaining throughout repeated reinforcement sessions on long-duration missions. NASA biocybernetic

technologies and publications have developed a closed-loop concept that involves adjusting or modulating (cybernetic, for governing) a person's task environment based upon a comparison of that person's physiological responses (bio-) with a training or performance criterion. This approach affords the opportunity to deliver physiological self-regulation training in an entertaining and motivating fashion and can also be employed to create a conditioned association between effective performance state and task execution behaviors, while enabling tracking of individuals psychophysiological status over time in the context of an interactive task challenge. This paper describes the aerospace spin-off technologies in this training application area as well as the current spin-back application of the technologies to long-duration missions - the Recreation Embedded State Tuning for Optimal Readiness and Effectiveness (RESTORE) concept. The RESTORE technology is designed to provide a physiological self-regulation training countermeasure for maintaining and reinforcing cognitive readiness, resilience under psychological stress, and effective mood states in long-duration crews. The technology consists of a system for delivering physiological self-regulation training and for tracking crew central and autonomic nervous system function; the system interface is designed to be experienced as engaging and entertaining throughout repeated training sessions on long-duration missions. Consequently, this self-management technology has threefold capability for recreation, behavioral health problem prophylaxis and remediation, and psychophysiological assay. The RESTORE concept aims to reduce the risk of future manned exploration missions by enhancing the capability of individual crewmembers to self-regulate cognitive states through recreation-embedded training protocols to effectively deal with the psychological toll of long-duration space flight. Author

Education; Psychophysiology; Physiology

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20050192601 Virginia Modeling, Analysis and Simulation Center, Suffolk, VA, USA

Cognitive and Behavioral Psychological Research for Crowd Modeling

Gaskins, Ryland; Boone, Carlotta M.; Verna, Thomas M.; Petty, Mikel D.; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 18-1 - 18-5; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Psychologically based crowd modeling is essentially absent from current computer simulations and training. A two-fold method is proposed for incorporating a cognitive psychological layer into models of crowd behavior. Naturalistic observation techniques are employed to measure human behaviors during the 1999 World Trade Organization protest, a 2004 antiwar protest, and military MOUT training exercises involving crowds. Survey research is employed to identify and describe crowd and control force interaction variables and the strength of the relation between variables and a crowd turning violent. The results of these two studies will contribute to an on-going effort to provide a psychological basis for a more realistic model of crowd-control force interactions.

Author

Computerized Simulation; Education; Cognition; Cognitive Psychology

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20050188608 Agency for Healthcare Research and Quality, Rockville, MD USA

Can An Academic Health Care System Overcome Barriers to Clinical Guideline Implementation?

Quinn, Debra; Cooper, Mary; Chevalier, Lynn; Balentine, Jerry; Kadish, Lawrence; Walerstein, Steven; Weinbaum, Fredric; Callahan, Mark; Lazar, Eliot; Jan. 2005; 14 pp.; In English

Report No.(s): AD-A434230; No Copyright; Avail: CASI; A03, Hardcopy

VWhile cardiovascular complications remain a leading cause of perioperative morbidity and mortality, studies have shown that prophylactic beta-blocker therapy can reduce the incidence of ischemia, myocardial infarction (MI), and cardiac death. Consensus guidelines and the publication of a recent meta-analysis support the use of perioperative beta-blockade in

patients who are at risk for adverse cardiac events, but few studies have examined the practical application of theses clinical guidelines. We performed a multicenter intervention study in five acute care hospitals to measure, characterize, and increase the utilization of perioperative beta-blocker therapy for surgical patients at intermediate to high risk of cardiac complications. We also reviewed all cases of perioperative MI. Following baseline observations, we developed a multifaceted educational intervention using grand rounds, academic detailing, and peer profiling to disseminate current guidelines for perioperative beta-blocker use. We the collected postintervention data to assess changes in practice patterns and clinical outcomes. Preliminary results demonstrate a significant underutilization of perioperative beta-blocker therapy among patients at risk for adverse cardiac events, and we have identified several barriers to implementing the guidelines. This paper highlights the lessons learned while implementing a clinical guideline and working to promote an evidence-based intervention aimed at improving patient safety.
DTIC
Cardiovascular System; Health; Ischemia; Myocardial Infarction

20050188619 Agency for Healthcare Research and Quality, Rockville, MD USA
Creating a Culture of Patient Safety through Innovative Hospital Design
Reiling, John G.; May 2005; 16 pp.; In English
Report No.(s): AD-A434248; No Copyright; Avail: CASI; A03, Hardcopy

When SynergyHealth, St. Joseph's Hospital of West Bend, Wisconsin, decided to relocate and build an 82-bed acute care facility, they recognized the opportunity to design a hospital that focused on patient safety. Hospital leaders believed that if a facility design process was 'engineered properly,' it would enhance patient safety and create a patient safe culture. Unfortunately, the planners found little information to give them direction. To help them plan the new facility, they conducted a national learning lab, drawing what they could about patient safety from available literature; inviting experts from the health care profession and other fields, including transportation, spacecraft design, and systems engineering; and involving hospital board members, staff, physicians, and the facility design team. In this case study, the author describes the process used by St. Joseph's to design a new hospital around patient safety. The author also discusses safety design principles, providing examples of their application at St. Joseph's new facility. Finally, recommendations are presented for the architectural design of all health care systems, including new facilities, remodeling efforts, and additions.
DTIC
Design Analysis; Hospitals; Human Factors Engineering; Patients; Safety; Structural Engineering

20050192596 USA Joint Forces Command, Suffolk, VA, USA
The Joint National Training Capability 'The Cornerstone of Training Transformation'
Knapp, Gregory F.; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 3-1 - 3-13; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

NATO, in a manner similar to the USA, has embarked on a journey to transform the ways in which NATO forces are manned, organized, equipped, and employed. The vehicle upon which we travel that journey is training. Training provides the integrating environment for transformation. As concepts in tactics, techniques, procedures, and doctrine are developed or as new weapons are developed, they cannot be employed until the soldiers, sailors, airmen, and Marines are trained in their use and become proficient in employing them in a realistic battlespace. Transformation of NATO calls for an accompanying transformation of NATO training. In January 2003 US Secretary of Defense Donald Rumsfeld, recognizing the relationship between transformation and training transformation, assigned Joint Forces Command a critical new role: transform training through the establishment of a Joint National Training Capability. This capability is significantly improving joint training by embedding joint tactical tasks in Service training events, closing horizontal gaps between Service training programs, establishing broader joint interoperability training events, and configuring exercises to improve vertical exercise linkages; all in a globally distributed training environment. The first transformation of training was the establishment and improvement of Service national training centers. These sites provided the Services with robust, dynamic training in a realistic, albeit Servicecentric, combat environment. The JNTC is producing a second transformation in training by extending the Service-centric focus to encompass joint and combined operations. The JNTC is improving joint training in four critical areas: combat realism in a joint context, adaptive and credible opposition forces, common ground truth through improved instrumentation and data sharing, and high quality feedback through assessments of joint training events. The JNTC reaches beyond the essentials of training event planning and execution. JNTC coalesces Service, allied, and coalition investments in training systems and infrastructure such that the tools of training are joint and combined tools. JNTC ensures that all elements of joint command and control systems, processes, and techniques are employed in Service, joint, and multinational training.

JNTC provides oversight and management for diverse, unique, and expensive Service OPFOR investments such that critical OPFOR tools can be shared across Service and national boundaries. JNTC provides incentives to the Services and our coalition partners to ensure that investments in training are joint, interoperable, and support multinational operations. Finally, JNTC provides the resources, coordination, focus, and a test bed for the development and implementation of advanced training technologies including a live, virtual, constructive simulation laboratory. The JNTC is the cornerstone of training transformation creating a persistent joint training environment that enables US and multinational forces to train like they fight; at an affordable cost. JNTC is playing a major role in transforming training and operational effectiveness of our allied and coalition partners.
Author
Command and Control; Education; Interoperability; Combat; Feedback; Ground Truth; System Effectiveness

20050192608 Defence Research and Development Canada, Valcartier, Quebec, Canada
Science and Technology Support to Concept Development and Experimentation
Harrison, Nathalie; Lestage, Richard; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 10-1 - 10-11; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Concept Development and Experimentation (CD&E) has been identified as an enabler to armed forces transformation. CD&E relies on integrated and collaborative work in which the Science and Technology (S&T) community is an important player as a source of innovative concepts and technological advances. In order to achieve an efficient synergy, the S&T work should be tailored to the strategic planning needs. Among the different options to anchor S&T with CD&E, Modelling and Simulation (M&S) represents a recognized approach. This paper discusses process and technology issues to transition S&T expertise to better support CD&E activities. It focuses on the capture of Subject Matter Experts (SMEs) knowledge into models and the leveraging of engineering-level M&S. The investigation has been conducted in the context of a newly created Canadian Air Force CD&E organization. The evaluation of the proposed vision against the CD&E authorities expectations allows to conclude that M&S technology needs improvement to be fully integrated into derived applications such as CD&E. Therefore, the M&S community must focus on deploying a mature infrastructure to CD&E sites.
Author
Management Planning; Armed Forces; Technologies; Deployment

20050194602 American Trade Initiatives, Inc., Alexandria, VA, USA
Roadway Human Factors and Behavioral Safety in Europe
Keith, K.; Trentacoste, M.; Depue, L.; Granda, T.; Huckaby, E.; May 2005; 56 pp.; In English
Contract(s)/Grant(s): DTFH61-99-C-005
Report No.(s): PB2005-107475; No Copyright; Avail: CASI; A04, Hardcopy

Human factors issues associated with roadway design and operations are critical components of improving highway safety. The Federal Highway Administration, American Association of State Highway and Transportation Officials, and National Cooperative Highway Research Program sponsored a scanning study of European countries to identify how they incorporate human factors issues in the research, design, and operation of highways. The U.S. delegation observed seven concepts in Denmark, Finland, France, the Netherlands, Norway, and Sweden that it recommends for possible implementation in the USA. They include self-organizing roads, use of driving simulators in roadway design, multidisciplinary teams to investigate crashes, speed management techniques such as speed cameras, human-centered roadway analysis and design, cognitive models of drivers, and top-down leadership on safety goals.
NTIS
Europe; Highways; Human Factors Engineering; Safety

20050194608 Westinghouse Savannah River Co., Aiken, SC, USA
Applying Current Human Factors Engineering Guidance to Control Room Design
Feb. 22, 2005; 14 pp.; In English
Report No.(s): DE2005-837165; No Copyright; Avail: Department of Energy Information Bridge

The Westinghouse Savannah River Company (WSRC), a contractor to the Department of Energy, has compared Revisions 1 and 2 of NUREG -0700-Human System Interface Design Review Guideline, from the USA Nuclear Regulatory Commission Nuclear Regulatory Guide. The comparison has been made between the two different revisions of NUREG-0700; specifically with respect to which guidelines remained the same, the guidelines that were reformatted or reworded, additional guidelines,

and deleted guidelines. This comparison was made in preparation of revising the previously developed Human Factors Engineering Analysis Tool (HFE-AT) for automating the review, analysis, and evaluation of human system interface designs. This tool has been described at a previous IEEE Conference on Human Factors and Power Plants and the merits and benefits of the tool described at the 13th Annual Joint ISA/POWED/EPRI Controls and Instrumentation Conference. The tool has been successfully applied by WSRC to over eight facilities at the Savannah River Site (SRS).. This paper describes the methodology and results of the comparison and the plans to enhance the already successful automation tool. The number of criteria in NUREG-0700 increased from approximately 1650 in Revision 1 to almost 2200 in Revision 2. Approximately 1600 criteria remained the same, though they were significantly reorganized; while about 100 were reworded or reformatted to clarify or expand the guidance provided. Around 600 guidelines were added and approximately 70 deleted. The majority of the changes and additions reflect the recent impact that computer technology has had on industrial process control system human system interfaces and control rooms.
NTIS
Grasslands; Ground Based Control; Human Factors Engineering; Integrated Mission Control Center; Nuclear Power Plants; Rivers

20050196198 Air Force Research Lab., Brooks AFB, TX USA
The Impact of High Levels of Nitrogen in the Breathing Gas and In-Flight Denitrogenation on the Risk of Decompression Sickness (DCS) During Simulated Altitude Exposure
Pilmanis, Andrew A.; Webb, James T.; Balldin, Ulf; Apr. 2005; 33 pp.; In English
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A435103; AFRL-HE-BR-TR-2005-0036; No Copyright; Avail: CASI; A03, Hardcopy
Military aircraft oxygen systems may not always deliver 100% O2. Nitrogen and argon are present to various levels. Determining the effect of these inert gas levels on denitrogenation and decompression sickness (DCS) risk was needed to better manage the operational incidence of DCS. The partial pressure gradient of nitrogen partly determines the extent and rate of denitrogenation during altitude exposure, not the percentage of N2 in the mixture. The degree of denitrogenation influences the extent of bubble formation and DCS incidence. It was found that the increased nitrogen levels in the breathing gas while at altitudes of 18,000 to 25,000 ft did not increase DCS risk. Contrary to the results above 18,000 ft, the use of a high N2 breathing gas at 16,000 ft increased DCS incidence when compared to exposures with 100% O2. It was also found that stage 'prebreathing', or in-flight denitrogenation, at 16,000 ft prior to ascent to 25,000 ft is effective in reducing the DCS risk when compared to zero prebreathe exposures.
DTIC
Altitude; Altitude Simulation; Breathing Apparatus; Decompression Sickness; Denitrogenation; Exposure; Gas Mixtures; Nitrogen; Risk

20050196218 Air Force Research Lab., Brooks AFB, TX USA
Evaluation of the Joint Service Mustang Anti-G Suit
Annicelli, Lance; O'Connor, Robert; Isdahl, Wayne; Werchan, Paul; Balldin, Ulf; May 2005; 16 pp.; In English
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A435132; AFRL-HE-BR-TR-2005-0081; No Copyright; Avail: CASI; A03, Hardcopy
AFRL/HEPG conducted an initial evaluation of the Joint Service Mustang Anti-G Suit (JSMAGS) produced by Mustang Survival, Inc. Performance of the JSMAGS was compared to that of the CSU-13B/P anti-G suit. Four subjects completed centrifuge trials up to +9 Gz using positive pressure breathing provided by the COMBAT EDGE system in combination with each of the two anti-G suits. The tests were conducted within the limits established by a test plan previously approved by the Brooks Institute Review Board. The constraints of that test plan did not permit a determination of the G-endurance afforded by JSMAGS compared to that of the CSU-13B/P. While the small number of subjects in this quick-look effort did not permit any definitive statistics, these initial test results indicate that JSMAGS provides G-protection that is comparable to that provided by the CSU-13B/P and, as indicated by the heart rate data, may require less physical effort to provide that level of protection. Had the test plan limits permitted a longer SACM exposure, endurance values for JSMAGS may have been better due to a decreased physical effort requirement.
DTIC
Pressure Suits; Protection

20050196543 Naval Research Lab., Washington, DC USA

Integration of Sensor Technologies into Respirator Vapor Cartridges as End-of-Service-Life Indicators: Literature and Manufacturer's Review and Research Roadmap

Rose-Pehrsson, Susan L.; Williams, Monica L.; May 2005; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434905; NRL/MR/6112--05-8875; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report provides a state-of-the-art review of sensor integration into respirator vapor cartridges for end-of-service-life indication (ESLI). The study identifies current research and available products for use as ESLI. In addition, this report provides a road map for research and development to the National Institute for Occupational Safety and Health (NIOSH), National Personal Protective Technology Laboratory (NPPTL). The approach was to conduct a literature survey and to have detailed discussions with commercial manufacturers, user-group representatives, and key research groups. This report contains a library of research papers, patents, reports, and other communications discussing integration of various sensor technologies into protection equipment. The survey also provides current capabilities of commercial sensors. This report provides a review of the literature, the results of the discussions conducted, a description of the state of the art sensor technology, and concludes with recommendations for future research and development.

DTIC

Cartridges; Respirators; Service Life; Vapors

20050196755 Swedish Defence Research Establishment, Linkoeping, Sweden

Metodvalsverktyg Ett Hjaelpmedel vid Planering av MSI-Utvaerdering (Instrument for Choice of Methods A Means of Assistance in Planning of MSI-Evaluation)

Alfredson, J.; Oskarsson, P. A.; Castor, M.; Svensson, J.; Aug. 2004; 120 pp.; In Swedish

Report No.(s): PB2005-107453; FOI-R-1295-SE; No Copyright; Avail: CASI; A06, Hardcopy

When new defense systems are developed, adaptation concerning MSI (Man System interaction) is of great importance. Therefore, a prototype of an instrument to facilitate the choice of MSI-evaluation methods has been developed. The main purpose of the instrument is to demonstrate a model of an aid for FMV (Swedish Defence Material Administration) administrators to support them in their contact with research organizations, universities, and industry, when they are purchasing MSI-evaluations. The instrument includes 26 methods. The user of the instrument answers four questions about the evaluation. If R is performed early or late in the process of systems development. If the amount of available resources is large or small. If it is sufficient that contracted evaluators have general MSI-competence or if specific specialist competence is necessary. If users will be included in the evaluation or not. The answers to these questions guide the user through a tree shaped diagram. The diagram terminates in a leaf, where methods that may be suitable for the present evaluation are given. An adherent table gives the values of all methods for these four and further ten properties, which gives a good overview advantages and disadvantages of the different methods. For more detailed information of each method, each method is separately described in a table of 1-3 sides, where a detailed description of each specific property is given. The instrument has been tested in a workshop. The general view was that it has the potential to become a valuable aid for administrators in their processes of purchasing MSl-evaluations.

NTIS

Man Machine Systems; Selection; Systems Engineering

20050196767 National Inst. for Occupational Safety and Health, Atlanta, GA, USA

Fatality Assessment and Control Evaluation (FACE) Report: A Career Fire Fighter Drowns While Conducting Training Dive in New Hampshire

Jul. 13, 2005; 10 pp.; In English

Report No.(s): PB2005-107570; FACE-F2004-36; No Copyright; Avail: CASI; A02, Hardcopy

On March 11, 2004, a 43-year-old male career fire fighter drowned while training for fire department dive rescue operations. The victim was diving with another dive rescue team member in a large, partially ice-covered lake in New Hampshire when, after his partner lost visual track of him, the victim failed to surface. The dive partner notified authorities through a pedestrian and a commercial dock attendant while he continued searching from the land docks and parking area. Multiple governmental agencies and private commercial divers conducted an organized search for the missing diver, but the victims body was not found or recovered until the next day. He was pronounced dead on-scene. This is a NIOSH report of the incident.

NTIS

Accident Investigation; Education; Fires; Occupation

20050198851 NASA Glenn Research Center, Cleveland, OH, USA

Research and Technology Activities Supporting Closed-Brayton-Cycle Power Conversion System Development

Barrett, Michael J.; [2004]; 21 pp.; In English; 2nd International Energy Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA

Contract(s)/Grant(s): 22-973-80-10

Report No.(s): E-14853; No Copyright; Avail: CASI; A03, Hardcopy

The elements of Brayton technology development emphasize power conversion system risk mitigation. Risk mitigation is achieved by demonstrating system integration feasibility, subsystem/component life capability (particularly in the context of material creep) and overall spacecraft mass reduction. Closed-Brayton-cycle (CBC) power conversion technology is viewed as relatively mature. At the 2-kWe power level, a CBC conversion system Technology Readiness Level (TRL) of six (6) was achieved during the Solar Dynamic Ground Test Demonstration (SD-GTD) in 1998. A TRL 5 was demonstrated for 10 kWe-class CBC components during the development of the Brayton Rotating Unit (BRU) from 1968 to 1976. Components currently in terrestrial (open cycle) Brayton machines represent TRL 4 for similar uses in 100 kWe-class CBC space systems. Because of the baseline component and subsystem technology maturity, much of the Brayton technology task is focused on issues related to systems integration. A brief description of ongoing technology activities is given.

Author

Systems Engineering; Technology Assessment; Risk; Aerospace Systems; Creep Properties; Brayton Cycle

20050199429 NASA Glenn Research Center, Cleveland, OH, USA, National Center for Microgravity Research on Fluids and Combustion, USA

Applications in Bioastronautics and Bioinformatics: Early Radiation Cataracts Detected by Noninvasive, Quantitative, and Remote Means

Ansari, Rafat R.; King, James F.; Giblin, Frank J.; Research and Technology 2000; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Human exploration of Mars is a key goal in NASA's exploration planning in the next 20 years. Maintaining crew health and good vision is certainly an important aspect of achieving a successful mission. Continuous radiation exposure is a risk factor for radiation-induced cataracts in astronauts because radiation exposure in space travel has the potential of accelerating the aging process (ref. 1). A patented compact device (ref. 2) based on the technique of dynamic light scattering (DLS) was designed for monitoring an astronaut's ocular health during long-duration space travel. This capability of early diagnosis, unmatched by any other clinical technique in use today, may enable prompt initiation of preventive/curative therapy. An Internet web-based system integrating photon correlation data and controlling the hardware to monitor cataract development in vivo at a remote site in real time (teleophthalmology) is currently being developed. The new technology detects cataracts very early (at the molecular level). Cataract studies onboard the International Space Station will be helpful in quantifying any adverse effect of radiation to ocular health. The normal lens in a human eye, situated behind the cornea, is a transparent tissue. It contains 35 wt % protein and 65 wt % water. Aging, disease (e.g., diabetes), smoking, dehydration, malnutrition, and exposure to ultraviolet light and ionizing radiation can cause agglomeration of the lens proteins. Protein aggregation can take place anywhere in the lens, causing lens opacity. The aggregation and opacification could produce nuclear (central portion of the lens) or cortical (peripheral) cataracts. Nuclear and posterior subcapsular (the membrane's capsule surrounds the whole lens) cataracts, being on the visual optical axis of the eye, cause visual impairment that can finally lead to blindness. The lens proteins, in their native state, are small in size. As a cataract develops, this size grows from a few nanometers (transparent) to several micrometers (cloudy). Ansari and Datiles have shown that DLS can detect cataracts at least two to three orders of magnitude earlier noninvasively and quantitatively than the best imaging (Scheimpflug) techniques in clinical use today (ref. 3).

Author

Bioastronautics; Cataracts; Aerospace Medicine; Radiation Effects; Real Time Operation; Ultraviolet Radiation; Continuous Radiation

55
EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace Medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*.

20050192612 NASA Glenn Research Center, Cleveland, OH, USA
Mars Spark Source Prototype Developed
Eichenberg, Dennis J.; Lindamood, Glenn R.; VanderWal, Randall L.; Weiland, Karen J.; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Mars Spark Source Prototype (MSSP) hardware was developed as part of a proof of concept system for the detection of trace metals such as lead, cadmium, and arsenic in Martian dusts and soils. A spark discharge produces plasma from a soil sample, and detectors measure the optical emission from metals in the plasma to identify and quantify them. Trace metal measurements are vital in assessing whether or not the Martian environment will be toxic to human explorers. The current method of x-ray fluorescence can yield concentrations of major species only. Other instruments are incompatible with the volume, weight, and power constraints for a Mars mission. The new instrument will be developed primarily for use in the Martian environment, but it would be adaptable for terrestrial use in environmental monitoring. The NASA Glenn Research Center at Lewis Field initiated the development of the MSSP as part of Glenn's Director's Discretionary Fund project for the Spark Analysis Detection of Trace Metal Species in Martian Dusts and Soils. The objective of this project is to develop and demonstrate a compact, sensitive optical instrument for the detection of trace hazardous metals in Martian dusts and soils.
Derived from text
Mars Surface; Mars Environment; Exobiology

20050196689 Colorado Univ., Boulder, CO, USA
Convection in Icy Satellites: Implications for Habitability and Planetary Protection
Barr, A. C.; Pappalardo, R. T.; [2004]; 1 pp.; In English
Contract(s)/Grant(s): NCC2-1340; No Copyright; Avail: Other Sources; Abstract Only

Solid-state convection and endogenic resurfacing in the outer ice shells of the icy Galilean satellites (especially Europa) may contribute to the habitability of their internal oceans and to the detectability of any biospheres by spacecraft. If convection occurs in an ice I layer, fluid motions are confined beneath a thick stagnant lid of cold, immobile ice that is too stiff to participate in convection. The thickness of the stagnant lid varies from 30 to 50% of the total thickness of the ice shell, depending on the grain size of ice. Upward convective motions deliver approximately 10(exp 9) to 10(exp 13) kg yr(sup -1) of ice to the base of the stagnant lid, where resurfacing events driven by compositional or tidal effects (such as the formation of domes or ridges on Europa, or formation of grooved terrain on Ganymede) may deliver materials from the stagnant lid onto the surface. Conversely, downward convective motions deliver the same mass of ice from the base of the stagnant lid to the bottom of the satellites ice shells. Materials from the satellites surfaces may be delivered to their oceans by downward convective motions if material from the surface can reach the base of the stagnant lid during resurfacing events. Triggering convection from an initially conductive ice shell requires modest amplitude (a few to tens of kelvins) temperature anomalies to soften the ice to permit convection, which may require tidal heating. Therefore, tidal heating, compositional buoyancy, and solid-state convection in combination may be required to permit mass transport between the surfaces and oceans of icy satellites. Callisto and probably Ganymede have thick stagnant lids with geologically inactive surfaces today, so forward contamination of their surfaces is not a significant issue. Active convection and breaching of the stagnant lid is a possibility on Europa today, so is of relevance to planetary protection policy.
Author
Convection; Exobiology; Galilean Satellites; Habitability; Icy Satellites; Planetary Protection

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20050192565 Lawrence Livermore National Lab., Livermore, CA USA
Reversible n-Bit to n-Bit Integer Haar-Like Transforms
Senecal, J.; Duchaineau, M.; Joy, K. I.; Nov. 04, 2003; 16 pp.; In English
Report No.(s): DE2005-15013668; UCRL-CONF-200745; No Copyright; Avail: Department of Energy Information Bridge

We introduce a wavelet-like transform similar to the Haar transform, but with the properties that it packs the results into the same number of bits as the original data, and is reversible. Our method, called TLHaar, uses table lookups to replace the averaging, differencing, and bit shifting performed in a Haar IntegerWavelet Transform (IWT). TLHaar maintains the same coefficient magnitude relationships for the low- and high-pass coefficients as true Haar, but reorders them to fit into the same number of bits as the input signal, thus eliminating the sign bit that is added to the Haar IWT output coefficients. Eliminating the sign bit avoids using extra memory and speeds the transform process. We tested TLHaar on a variety of image types, and when compared to the Haar IWT TLHaar is significantly faster. For image data with lines or hard edges TLHaar coefficients compress better than those of the Haar IWT. Due to its speed TLHaar is suitable for streaming hardware implementations with fixed data sizes, such as DVI channels.
NTIS
Integers; Transformations (Mathematics); Wavelet Analysis

20050194611 Lawrence Livermore National Lab., Livermore, CA USA
Solution of the Modified Bratu Problem in SAMRAI
Pernice, M.; Gunney, B. T.; Feb. 03, 2004; 24 pp.; In English
Report No.(s): DE2005-15013877; UCRL-TR-202155; No Copyright; Avail: Department of Energy Information Bridge
A model implementation of the solution of an unsteady nonlinear reaction-diffusion on a a SAMR grid using SAMRAI has been developed. This model implementation illustrates the use of new capabilities for implicit timestepping and solution of large-scale systems of nonlinear equations using implementations of inexact Newton methods found in KINSOL and PETSc. This document provides a detailed description of the implementation.
NTIS
Computational Grids; Grid Generation (Mathematics); Solutions; Structured Grids (Mathematics)

20050194648 TRW Environmental Services, Washington, DC, USA
Civilian Radioactive Waste Management System Management and Operating Contractor. Operational Waste Stream Assumption for TSLCC Estimates TDR-CRW-MD-000001 REV 00
Sep. 2000; 60 pp.; In English
Report No.(s): DE2005-828106; No Copyright; Avail: Department of Energy Information Bridge
This document provides the background and basis for the operational waste stream used in the 2000 Total System Life Cycle Cost (TSLCC) estimate for the Civilian Radioactive Waste Management System (CRWMS). This document has been developed in accordance with its Development Plan (CRWMS M&O 2000a), and AP-3.11Q, 'Technical Reports'.
NTIS
Life Cycle Costs; Management Systems; Radioactive Wastes; Waste Management

20050194677 Lawrence Livermore National Lab., Livermore, CA USA
Seeing and Reading Red: Hue and Color-word Correlation in Images and Attendant Text on the WWW
Newsam, S.; Jul. 13, 2004; 14 pp.; In English
Report No.(s): DE2005-15014465; UCRL-CONF-205192; No Copyright; Avail: Department of Energy Information Bridge
This work represents an initial investigation into determining whether correlations actually exist between metadata and content descriptors in multimedia datasets. We provide a quantitative method for evaluating whether the hue of images on the WWW is correlated with the occurrence of color-words in metadata such as URLs, image names, and attendant text. It turns out that such a correlation does exist: the likelihood that a particular color appears in an image whose URL, name, and/or attendant text contains the corresponding color-word is generally at least twice the likelihood that the color appears in a randomly chosen image on the WWW. While this finding might not be significant in and of itself, it represents an initial step towards quantitatively establishing that other, perhaps more useful correlations exist. These correlations form the basis for exciting novel approaches that leverage semi-supervised datasets, such as the WWW, to overcome the semantic gap that has hampered progress in multimedia information retrieval for some time now.
NTIS
Color; Data Management; Data Processing; Reading; Texts; Words (Language); World Wide Web

20050194686 Lawrence Livermore National Lab., Livermore, CA USA
LLNL's Parallel I/O Testing Tools and Techniques for ASC Parallel File Systems
Loewe, W. E.; Hedges, R. M.; McLarty, T. T.; Morrone, C. J.; Apr. 16, 2004; 16 pp.; In English
Report No.(s): DE2005-15014077; UCRL-CONF-203489; No Copyright; Avail: Department of Energy Information Bridge

Livermore Computing is an early and aggressive adopter of parallel file systems including, for example, GPFS from IBM and Lustre for our present Linux systems. As such, we have acquired more than our share of battle scars from encountering bugs in 'bleeding edge' file systems that we have pressed into production to serve our customers massive I/O requirements. A major role of the Scalable I/O Project is to detect errors before our end users do. In order to do this, we have developed highly parallel test codes to stress and probe potentially weak areas of file system behavior. This paper describes those test programs and how we make use of them.
NTIS
Parallel Processing (Computers); File Maintenance (Computers)

20050196741 General Accounting Office, Washington, DC, USA
Information Security: Weaknesses Persist at Federal Agencies Despite Progress Made in Implementing Related Statutory Requirements
Jul. 2005; 58 pp.; In English
Report No.(s): PB2005-109031; GAO-05-552; No Copyright; Avail: CASI; A04, Hardcopy
Federal agencies rely extensively on computerized information systems and electronic data to carry out their missions. The security of these systems and data is essential to prevent data tampering, disruptions in critical operations, fraud, and inappropriate disclosure of sensitive information. Concerned with accounts of attacks on systems via the Internet and reports of significant weaknesses in federal computer systems that make them vulnerable to attack, Congress passed the Federal Information Security Management Act (FISMA) in 2002. In accordance with FISMA requirements that the Comptroller General report periodically to the Congress, GAOs objectives in this report are to evaluate (1) the adequacy and effectiveness of agencies information security policies and practices and (2) the federal governments implementation of FISMA requirements.
NTIS
Information Systems; Security

20050196760 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, California Univ., Davis, CA, USA
Edge Preserving Smoothing and Sementation of 4-D Images via Transversely Isotropic Scale-Space Processing and Fingerprint Analysis
Reutter, B. W.; Algazi, V. R.; Gullberg, G. R.; Huesman, R. H.; January 2004; 14 pp.; In English
Report No.(s): DE2005-836236; LBNL-53558; No Copyright; Avail: Department of Energy Information Bridge
Enhancements are described for an approach that unifies edge preserving smoothing with segmentation of time sequences of volumetric images, based on differential edge detection at multiple spatial and temporal scales. Potential applications of these 4-D methods include segmentation of respiratory gated positron emission tomography (PET) transmission images to improve accuracy of attenuation correction for imaging heart and lung lesions, and segmentation of dynamic cardiac single photon emission computed tomography (SPECT) images to facilitate unbiased estimation of time-activity curves and kinetic parameters for left ventricular volumes of interest. Improved segmentation of lung surfaces in simulated respiratory gated cardiac PET transmission images is achieved with a 4-D edge detection operator composed of edge preserving 1-D operators applied in various spatial and temporal directions. Smoothing along the axis of a 1-D operator is driven by structure separation seen in the scale-space fingerprint, rather than by image contrast. Spurious noise structures are reduced with use of small-scale isotropic smoothing in directions transverse to the 1-D operator axis. Analytic expressions are obtained for directional derivatives of the smoothed, edge preserved image, and the expressions are used to compose a 4-D operator that detects edges as zero-crossings in the second derivative in the direction of the image intensity gradient. Additional improvement in segmentation is anticipated with use of multiscale transversely isotropic smoothing and a novel interpolation method that improves the behavior of the directional derivatives. The interpolation method is demonstrated on a simulated 1-D edge and incorporation of the method into the 4-D algorithm is described.
NTIS
Image Processing; Isotropy; Smoothing; Space Processing

20050196790 Lawrence Livermore National Lab., Livermore, CA USA
Ray Tracing through a Hexahedral Mesh in HADES
Henderson, G. L.; Aufderheide, M. B.; Dec. 03, 2004; 14 pp.; In English
Report No.(s): DE2005-15014658; UCRL-CONF-208375; No Copyright; Avail: Department of Energy Information Bridge
In this paper we describe a new ray tracing method targeted for inclusion in HADES. The algorithm tracks rays through

three-dimensional tetrakis hexahedral mesh objects, like those used by the ARES code to model inertial confinement experiments.
NTIS
Grid Generation (Mathematics); Ray Tracing

20050196796 Lawrence Livermore National Lab., Livermore, CA USA
Babel 1.0 Release Criteria: A Working Document
Kumfert, G.; Dahlgren, T.; Epperly, T.; Leek, J.; Oct. 21, 2004; 16 pp.; In English
Report No.(s): DE2005-15014783; UCRL-TR-207393; No Copyright; Avail: Department of Energy Information Bridge

In keeping with the Open Source tradition, we want our Babel 1.0 release to indicate a certain level of capability, maturity, and stability. From our first release (version 0.5.0) in July of 2001 to our current (18 18th th) release (version 0.9.6) we have continued to add capabilities in response to customer feedback, our observations in the field, and a consistent vision for interoperability. The key to our maturity is without a doubt the ever-increasing demands of our growing user base both in terms of sheer size and sophistication with the underlying technology. The first draft of this document was circulated internally in June 2003. A revised draft was then presented at the July 2003 CCA meeting. A third revision was made into the current working document form & circulated for general comment on the babel-users mailing list and Babels homepage. The working document was intended to be an open record tracking progress in subsequent Babel releases. A major revision of the document (including adding new items and promoting/demoting items) was done in October 2004, well after the 0.9.6 release.
NTIS
Computer Programs; Programming Languages; Interoperability

20050199072 NASA Ames Research Center, Moffett Field, CA, USA
Verification, Validation, and Solution Quality in Computational Physics: CFD Methods Applied to Ice Sheet Physics
Thompson, David E.; May 23, 2005; 37 pp.; In English
Contract(s)/Grant(s): 21-612-40-81-03
Report No.(s): NASA/TM-2005-213453; No Copyright; Avail: CASI; A03, Hardcopy

Procedures and methods for veri.cation of coding algebra and for validations of models and calculations used in the aerospace computational fluid dynamics (CFD) community would be ef.cacious if used by the glacier dynamics modeling community. This paper presents some of those methods, and how they might be applied to uncertainty management supporting code veri.cation and model validation for glacier dynamics. The similarities and differences between their use in CFD analysis and the proposed application of these methods to glacier modeling are discussed. After establishing sources of uncertainty and methods for code veri.cation, the paper looks at a representative sampling of veri.cation and validation efforts that are underway in the glacier modeling community, and establishes a context for these within an overall solution quality assessment. Finally, a vision of a new information architecture and interactive scienti.c interface is introduced and advocated.
Author
Computational Fluid Dynamics; Algebra; Coding; Analogies

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20050195900 Texas Univ., Arlington, TX USA
Energy Efficient Wireless Sensor Networks Using Fuzzy Logic
Liang, Qilian; Jun. 2005; 84 pp.; In English
Contract(s)/Grant(s): N00014-03-1-0466
Report No.(s): AD-A434605; No Copyright; Avail: CASI; A05, Hardcopy

During the period of 12/1/2004-5/31/2005, we have proposed different approaches on energy efficient wireless sensor networks. 1) We proposed an event forecasting methodology for wireless sensor networks using interval type-2 fuzzy logic system. We also studied the fundamental performance analysis of different event detection schemes. 2)We studied spectrum efficient coding scheme for correlated non-binary sources because there exists bandwidth constraint in wireless sensor networks. 3) We proposed to reduce the redundancy in wireless sensor networks using SVD-QR method. 4) A hybrid approach for Asynchronous Energy-Efficient MAC (ASEMAC) Protocol was proposed for wireless sensor networks. 5) We studied

energy-efficient query in sensor database systems with uncertainties. 6) We proposed a fuzzy sensor deployment scheme, and studied clustering in sensor networks with fuzzy cluster radius. 7) We proposed a cross-layer (physical layer, data-link layer and application layer) design scheme for mobile ad hoc networks. Eleven papers were produced during the past six months, and are attached to this report.
DTIC
Communication Networks; Detection; Energy Conservation; Fuzzy Systems; Wireless Communication

20050196120 Northwestern Univ., Evanston, IL USA
COGSCI Applications
Forbus, Kenneth D.; May 2005; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-04-1-0113; Proj-COGV
Report No.(s): AD-A434980; AFRL-IF-RS-TR-2005-170; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this effort was to provide support for the following conference and workshop which were held during August 2004 in Chicago IL: The 26th Annual Conference of the Cognitive Science Society. This conference is the premier venue for reporting current work in Cognitive Science. This conference is the primary meeting where new results on analogical reasoning and learning are reported. The 18th International Workshop on Qualitative Reasoning. This workshop is the premier venue for reporting current work in qualitative reasoning. For example, results on human-like spatial reasoning, reasoning about complex devices, and creating intuitive models of complex non-linear dynamic systems of strong interest are reported there.
DTIC
Artificial Intelligence; Knowledge Based Systems; Robotics

20050196549 NASA Glenn Research Center, Cleveland, OH, USA
Cost/Performance Ratio Achieved by Using a Commodity-Based Cluster
Lopez, Isaac; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Researchers at the NASA Glenn Research Center acquired a commodity cluster based on Intel Corporation processors to compare its performance with a traditional UNIX cluster in the execution of aeropropulsion applications. Since the cost differential of the clusters was significant, a cost/performance ratio was calculated. After executing a propulsion application on both clusters, the researchers demonstrated a 9.4 cost/performance ratio in favor of the Intel-based cluster. These researchers utilize the Aeroshark cluster as one of the primary testbeds for developing NPSS parallel application codes and system software. The Aero-shark cluster provides 64 Intel Pentium II 400-MHz processors, housed in 32 nodes. Recently, APNASA - a code developed by a Government/industry team for the design and analysis of turbomachinery systems was used for a simulation on Glenn's Aeroshark cluster.
Author
Supercomputers; Computer Systems Performance; Central Processing Units; Parallel Processing (Computers)

20050196809 NASA Glenn Research Center, Cleveland, OH, USA
Ultrasonic Data Display and Analysis System Developed (Including Fuzzy Logic Analysis) for the Windows-Based PC
Lovelace, Jeffrey J.; Cios, Kryzsztof J.; Roth, Don J.; cAO, wEI n.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Post-Scan Interactive Data Display (PSIDD) III is a user-oriented Windows-based system that facilitates the display and comparison of ultrasonic contact measurement data obtained at NASA Glenn Research Center's Ultrasonic Nondestructive Evaluation measurement facility. The system is optimized to compare ultrasonic measurements made at different locations within a material or at different stages of material degradation. PSIDD III provides complete analysis of the primary waveforms in the time and frequency domains along with the calculation of several frequency-dependent properties including phase velocity and attenuation coefficient and several frequency-independent properties, like the cross correlation velocity. The system allows image generation on all the frequency-dependent properties at any available frequency (limited by the bandwidth used in the scans) and on any of the frequency-independent properties. From ultrasonic contact scans, areas of interest on an image can be studied with regard to underlying raw waveforms and derived ultrasonic properties by simply selecting the point on the image. The system offers various modes of indepth comparison between scan points. Up to five scan points can be selected for comparative analysis at once. The system was developed with Borland Delphi software (Visual

Pascal) and is based on an SQL data base. It is ideal for the classification of material properties or the location of microstructure variations in materials. Along with the ultrasonic contact measurement software that it is partnered with, this system is technology ready and can be transferred to users worldwide.
Derived from text
Ultrasonic Tests; Fuzzy Systems; Computer Programs

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20050188555 Defence Science and Technology Organisation, Salisbury, Australia
Coalition Theater Logistics (CTL) Advanced Concept Technology Demonstrator (ACTD) Web Services Documentation
Kabacinski, Kuba; Kuster, Egon; Mar. 2005; 145 pp.; In English; Original contains color illustrations
Report No.(s): AD-A433786; DSTO-TN-0619; DODA-AR-013-356; No Copyright; Avail: Defense Technical Information Center (DTIC)

This document describes the development and utilisation of web services in the Coalition Theatre Logistics Advanced Concept Technology Demonstrator (CTL ACTD) prototype. Included is a background on web services, issues with using web services, and technical details and specifications of all services used in CTL ACTD. The appendices contain sample Web Service Description Language (WSDL) files and the current XML Schema definition. Information contained herein captures current implementation details and can be used as a reference for future implementation. This document does not convey details of the operational CTL Spiral 1 and 2 currently deployed as part of JP2030's Movement Management System (MMS). Only details about the CTL ACTD prototype system are covered herein.
DTIC
Architecture (Computers); Logistics; Proving

20050188571 Defence Science and Technology Organisation, Salisbury, Australia
CAEn Building Editor Tool Manual
Shine, Denis R.; Jan. 2005; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434140; DSTO-GD-0422; DODA-AR-013-294; No Copyright; Avail: CASI; A03, Hardcopy

Creation and modification of buildings within the Close Action Environment (CAEn) wargame can be a complex and time consuming task. The CAEn Building Editor Tool, or Builder, simplifies this process by providing and efficient graphical interface to edit CAEn buildings. The use of Builder can greatly speed up the production of urban environments within CAEn.
DTIC
Buildings; Combat; Simulation; Software Development Tools; War Games

20050188580 Space and Naval Warfare Systems Center, San Diego, CA USA
Advanced Distributed Simulation: Decade in Review and Future Challenges
Hardy, Douglas R.; Allen, Elaine C.; Adams, Kevin P.; Peters, Charles B.; Peterson, Larry J.; Cannon, Michael A.; Steinman, Jeffrey S.; Walter, Bruce W.; Aug. 2001; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434191; No Copyright; Avail: CASI; A03, Hardcopy

As networking technologies and computer hardware performance advanced in the late 1980s, distributed simulation became a feasible way to provide military training at distant, sometimes remote locations. Efforts were made to advance the technologies surrounding distributed simulation, from networking protocols to the representation of the battlespace and its entities. The SSC San Diego efforts described in this paper supported advances in distributed-simulation-related areas throughout the 1990s and continue to support the next generation of 21st century simulation systems.
DTIC
Combat; Distributed Interactive Simulation; Education; Military Operations; Simulation

20050188581 Space and Naval Warfare Systems Center, San Diego, CA USA
Perspective View Displays and User Performance
Cowen, Michael B.; Aug. 2001; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434192; No Copyright; Avail: CASI; A02, Hardcopy

Consoles that use three-dimensional (3-D) perspective views on flat screens to display data seem to provide a natural, increasingly affordable solution for situational awareness tasks. However, the empirical evidence supporting the use of 3-D displays is decidedly mixed. Across an array of tasks, a number of studies have found benefits for 3-D perspective over two-dimensional (2-D) views, while other studies have found rough parity, and still other studies have found 2-D superior to 3-D. Interestingly, many realistic military tasks have complex demands that require both types of views at different points in time. This paper investigates an interface concept called 'orient and operate,' which employs the advantages of both 2-D and 3-D displays.
DTIC
Display Devices; Flat Panel Displays; Format; Human-Computer Interface; Systems Integration

20050188631 Space and Missile Systems Organization, Los Angeles AFB, CA USA
Final Environmental Assessment for Minuteman III Modification
Huynh, Thomas; Kriz, Joseph; Lindman, Terry; Ramanujam, Ram; Dec. 2004; 221 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DASG60-02-D-0011
Report No.(s): AD-A434266; SMC-AXF-2004-11; No Copyright; Avail: CASI; A10, Hardcopy
This Environmental Assessment documents the potential environmental impacts of: (1) Minuteman III missile flight tests using modified Reentry System (RS) hardware/software, in addition to the continuation of Force Development Evaluation flight tests; (2) deployment of new and modified RS hardware/ software; and (3) deployment activities for new command and control console equipment. The locations covered in this EA include: FE Warren Air Force Base (AFB), WY; Hill AFB, UT; Malmstrom AFB, MT; Minot AFB, ND; Vandenberg AFB, CA; and US Army Kwajalein Atoll, Republic of the Marshall Islands.
DTIC
Environmental Surveys; Flight Tests; Minuteman Icbm; Surface to Surface Missiles

20050188664 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Status of Department of Defense Architecture Framework (DoDAF) implementation within the Aeronautical Systems Center (ASC)
Millette, Chad A.; Mar. 2005; 86 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434311; AFIT/GSM/ENV/05M-03; No Copyright; Avail: Defense Technical Information Center (DTIC)
The purpose of this research was to identify the current status of the use of the Department of Defense Architecture Framework (DoDAF) systems architecture products within the Aeronautical Systems Center (ASC) program offices. There are regulatory requirements dictating the creation of DoDAF products as annexes to programmatic documentation, such as the Joint Capabilities Integration Development System (JCIDS) requirement for systems architectures as annexes for acquisition milestone decision documentation. In addition, the DoDAF itself identifies several products as being highly applicable for the development of acquisition strategies. This thesis investigated the use of systems architectures, and particularly DoDAF products, within the context of Air Force weapon systems acquisitions, as represented by ASC. The research indicated two conclusions: while programs required to follow the new acquisition processes are doing so, very few are employing systems architectures systematically, and at this point, at least within ASC, the benefits to acquisition program management personnel derived from an architectural context are not yet being realized. These conclusions result in several recommendations to ASC, the DoDAF Working Group, and the systems engineering community in general in terms of making systems architectures the standard way of doing business within Air Force weapon system acquisitions efforts. Specific procurement success stories are documented, including the Airborne Electronic Attack (AEA), the B-2 Group, and the Tanker Modernization Squadron.
DTIC
Decision Support Systems; Defense Program; Government Procurement; Systems Engineering; Systems Management; Weapon Systems

20050188687 Agency for Healthcare Research and Quality, Rockville, MD USA
From Insight to Implementation: Lessons from a Multi-Site Trial of a PDA-Based Warfarin Dose Calculator
Kravitz, Richard L.; Neufeld, Jonathan D.; Hogarth, Michael A.; Paterniti, Debora A.; Dagar, William; White, Richard H.; May 2005; 16 pp.; In English
Contract(s)/Grant(s): R18HS11804
Report No.(s): AD-A434344; No Copyright; Avail: Defense Technical Information Center (DTIC)

Clinical decision support (CDS) systems show promise for enhancing patient safety, but they require rigorous evaluation before they can be implemented widely. We developed a software application for use with personal digital assistants (PDAs) that models patient-specific dose responses to help physicians predict steady-state warfarin dosing requirements and steer patients to a therapeutic level of anticoagulation as quickly and safely as possible. We also designed a randomized, controlled multi-site trial to evaluate the effectiveness of the Warfarin Dosing and Communication System (WARFDOCS) in reducing warfarin-related errors. Numerous obstacles delayed implementation of the CDS system and completion of the trial. To better understand the causes that led to the delay, we interviewed key informants at participating hospitals; reviewed study protocols, administrative records, and meeting minutes; and held discussions to review the data and their interpretation. Salient themes were identified by consensus of the research team and these were corroborated by key informants. Four major themes emerged. First, agreement to participate in the trial reflected very different levels of commitment. Sites participating in CDS system evaluations must be managed actively. Second, the enthusiasm of end-users for a CDS system was derived from a complex calculus of perceived benefits and burdens. Unfortunately, the most relevant appeal (that such a system would markedly improve patient safety) could not be made in advance of the trial. Third, research changes everything. Valid research procedures (e.g., informed consent, randomization, and intrusive data collection) may be necessary, but can themselves affect a key outcome of most CDS system evaluations: user uptake. Fourth, strong center effects (i.e., the CDS system proved effective at some sites, but not at others) should be expected. If all politics is local, then much of patient safety research is localized as well.
DTIC
Anticoagulants; Calculators; Decision Support Systems; Dosage; Portable Equipment; Software Development Tools

20050188711 Department of Defense, Arlington, VA USA
Information Technology Management: Report on Standard Finance System Controls Placed in Operation and Tests of Operating Effectiveness for the Period October 1, 2004 through March 31, 2005
Apr. 2005; 137 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434382; IG/DOD-D-2005-059; No Copyright; Avail: CASI; A07, Hardcopy

This report is intended for the use of DFAS and DISA management, its user organizations, and the independent auditors of its user organizations. Department of Defense personnel who manage and use the Standard Finance System (STANFINS) will also find this report of interest as it contains information about STANFINS general and application controls. The IG DoD is implementing a long-range strategy to conduct audits of DoD financial statements. The Chief Financial Officer's Act of 1990 (P.L. 101-576), as amended, mandates that agencies prepare and conduct audits of financial statements. The reliability of information in STANFINS directly impacts DoD's ability to produce reliable, and ultimately auditable, financial statements; which is key to achieving the goals of the Chief Financial Officer's Act. STANFINS is a general fund accounting system developed to support day-to-day operations of U.S. Army and National Guard installations world-wide, as well as the Defense Commissary Agency. Other DoD agencies receive trial balance data from STANFINS for use in preparing their financial statements. STANFINS provides support for fund and obligation control, budget execution and expenditure accounting, reimbursable accounting, miscellaneous accounting (disbursements and collections), general ledger control, and financial reporting. In FY 2003, STANFINS processed more than $300 billion of general fund transactions. This audit assessed controls over the STANFINS processing of the $300 billion of transactions at DFAS and DISA. This report provides an opinion on the fairness of presentation, the adequacy of design, and the operating effectiveness of key controls that are relevant to audits of user organization financial statements. As a result, this audit precludes the need for multiple audits of STANFINS controls previously performed by user organizations to plan or conduct financial statement and performance audits.
DTIC
Data Management; Finance; Information Systems; Management Information Systems; User Requirements

20050188717 Phillips Lab., Hanscom AFB, MA USA
Lattice-Gas Automata on Parallel Architectures
Yepez, Jeffrey; Seeley, Guy P.; Mou, George; Sep. 1993; 6 pp.; In English
Report No.(s): AD-A434391; No Copyright; Avail: CASI; A02, Hardcopy

Conserved Navier-Stokes dynamics can be exactly simulated by lattice gas methods. The authors have implemented lattice-gas automata (LGA) on three parallel architectures: MIT's CAM-8, Thinking Machine Corporations's CM-5, and Kendall Square Research's KSR1. For a 16-bit LGA the main findings are as follows: (1) the CAM-8 appears to be much more efficient than the other two parallel architectures, delivering 25 million site updates per second per module; (2) the CM-5 can simulate larger lattices due to its much larger memory sizes but can only deliver about 1 million site updates per second per node; and (3) the KSR1 can simulate about the same size lattice as the CM-5 and can deliver about 2 million site updates per

node. The authors conclude that the CAM-8 architecture is an elegant, arguably the best, distillation of lattice gas dynamics that has been realized in low-cost desktop hardware. they look forward to the construction of a larger CAM-8, with much more than eight modules, in the near future. The CM-5 results are based on a beta version of the software and are not necessarily representative of the full version of the software.
DTIC
Architecture (Computers); Automata Theory; Computerized Simulation; Gas Dynamics; Navier-Stokes Equation; Parallel Processing (Computers)

20050188718 Phillips Lab., Hanscom AFB, MA USA
Lattice-Gas Automata Fluids on Parallel Supercomputers
Yepez, Jeffrey; Seeley, Guy P.; Margolus, Norman H.; Nov. 1993; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434392; No Copyright; Avail: Defense Technical Information Center (DTIC)

A condensed history and theoretical development of lattice-gas automata in the Boltzmann limit is presented. This is provided as background to understanding the implementation of the lattice-gas method on two parallel supercomputers: the MIT cellular automata machine CAM-8 and the Connection Machine CM-5. The macroscopic limit of two-dimensional fluids is tested by simulating the Rayleigh-Benard convective instability, the Kelvin-Helmholtz shear instability, and the Von Karman vortex shedding instability. Performance of the two machines in terms of both site update rate and maximum problem size are comparable. The CAM-8, being a low-cost desktop machine, demonstrates the potential of special-purpose digital hardware.
DTIC
Architecture (Computers); Automata Theory; Boltzmann Transport Equation; Computerized Simulation; Gas Dynamics; Parallel Processing (Computers); Supercomputers

20050188764 Creare, Inc., Hanover, NH USA
A Java API for Low-Level Socket Network Access
Kaszeta, Richard W.; Friets, Eric M.; Jun. 2005; 15 pp.; In English
Contract(s)/Grant(s): W15P7T-05-C-S202; Proj-7406
Report No.(s): AD-A434518; CREARE-TM-2465A; No Copyright; Avail: CASI; A03, Hardcopy

The overall goal of this project is to develop a Java API which uses a native code library allowing Java programs to manipulate raw sockets through a consistent and secure interface. This API allows Java programs to directly implement low-level networking sockets, such as packet filtering, packet sniffing and reading of low-level IP or transport layer data.
DTIC
Communication Networks; Computer Networks; Joints (Junctions)

20050188804 RAND Corp., Santa Monica, CA USA
Swarming and the Future of Warfare
Edwards, Sean J.; Jan. 2005; 323 pp.; In English
Report No.(s): AD-A434577; No Copyright; Avail: CASI; A14, Hardcopy

The long-standing trends in warfare- greater non-linearity- beg the question of whether a dramatic change in military doctrine and organization is necessary. One possibility worthy of consideration is a doctrine based on swarming and other nonlinear, dispersed tactics. Very little historical research has been conducted on the use of swarming. This work seeks to address this deficiency by analyzing twenty three case studies of past swarming in order to derive a framework for understanding swarm outcomes. The conclusions of this historical analysis are then applied to a discussion of future swarming by both friendly and enemy forces.
DTIC
Military Operations; Strategy; Swarming; Tactics; Warfare

20050188812 Defence Science and Technology Organisation, Edgecliff, Australia
An Empirical Study of the Relationship between Situation Awareness and Decision Making
Stanners, Melinda; French, Han T.; Feb. 2005; 40 pp.; In English
Report No.(s): AD-A434593; DSTO-TR-1687; DODA-AR-013-336; No Copyright; Avail: Defense Technical Information Center (DTIC)

It is assumed that good situation awareness (SA) leads to good decision making, which is then expected to result in a good outcome. Despite increasing reliance on this assumption by the land force, little research has been undertaken to validate it.

This study attempts to address this deficiency. SA was assessed using the Direct Questioning Technique (DQT), which elicits SA through direct questioning during play. This is an adaptation of the Situation Awareness Global Assessment Technique. Responses to SA questions were compared against the ground truth of the scripted scenario. A relationship was found between SA and decision making, such that participants with a high degree of SA made high-quality decisions. SA also was related to planning. However, other factors also contributed significantly to decision quality and performance.
DTIC
Computerized Simulation; Decision Making; Reconnaissance; Situational Awareness; War Games; Warfare

20050188833 Agency for Healthcare Research and Quality, Rockville, MD USA
The Use of Surgical Simulators to Reduce Errors
Fried, Marvin P.; Satava, Richard; Weghorst, Suzanne; Gallagher, Anthony; Sasaki, Clarence; Ross, Douglas; Sinanan, Mika; Cuellar, Hernando; Uribe, Jose I.; Zeltsan, Michael; Jan. 2005; 14 pp.; In English
Report No.(s): AD-A434674; No Copyright; Avail: Defense Technical Information Center (DTIC)

The training of a surgeon includes the acquisition of a number of characteristics. These include a cognitive knowledge base, problem formulation and decisionmaking abilities, appropriate psychosocial relationships, and other attributes that can be measured with objective testing, such as national board or specialty certifying examinations. Perhaps most critical to the surgeon, however, are the core technical skills of the profession. A battery of sophisticated devices is being created to teach and provide objective evaluations of the trainee s technical abilities. These innovative state-of-the-art simulation devices, used to teach basic skills and surgical tasks through repetitive proctored challenges, will enable detection and analysis of surgical errors and near miss incidents without risk to patients. As with flight simulation, near miss detection capabilities anticipate potential errors before they occur and prevent resulting complications. In collaboration with a number of otolaryngology residency programs, we have developed a comprehensive training curriculum, based on complementary simulation tools and several perceptual and spatial ability test instruments, to provide objective metrics for assessing the technical skills of trainees. These tools include an endoscopic sinus surgery simulator for procedural training, and the Minimally Invasive Surgical Trainer-Virtual Reality (MIST-VR) system for basic surgical skills training. Technical errors are identified, quantified, and used to monitor surgical performance, after which the metrics are used for outcome analysis, for the purpose of improving patient safety. Validated metrics include time-to-completion, errors, economy of motion, and psychomotor tracking. Endoscopic sinus surgery is a suitable operation substrate, since it is a frequently performed procedure (more than 300,000 times annually in the USA.) and carries a significant risk of injury to the delicate neighboring eye and brain structur7
DTIC
Errors; Flight Simulation; Physicians; Safety; Simulators; Space Perception; Surgery

20050192488 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Getting the Picture on Imaging Software
Hogan, Hank, Editor; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 66-70; In English; Original contains color illustrations; Copyright; Avail: Other Sources

To hear Kyle Voosen tell it, there are really only two places to be when talking about industrial and machine vision applications. Machine vision products manager at National Instruments Corp. in Austin, Texas, Voosen noted that smart cameras and standard camera buses have done more than bring vision to the masses. The new technologies, along with improved computer performance, have shifted attention from frame grabbers to other aspects of vision. 'You're really finding that the focus is now either on cameras or software,' he said. For Voosen, that concentration is all right because his company considers software at the core of what it does. However, National Instruments isn't the only supplier of machine vision software. Others include German companies MVTec Software GmbH of Munich and Stemmer Imaging GmbH of Puchheim and Canadian firms Matrox Imaging of Dorval, Quebec, and Dalsa Coreco of Montreal. Of these vendors, only MVTec does not supply any hardware. However, all of them say that their software will run with a variety of cameras and other equipment, and that all are responding to general trends. These include the demand for easier-to-use software, looming changes in the basic programmming environment and increasing processing power.
Author
Computer Vision; Imaging Techniques; Computer Programs; Product Development; Image Processing

20050192589 Birmingham Univ., UK
WESTT: Reconfigurable Human Factors Model for Network Enabled Capability
Baber, Chris; Houghton, Robert; Cowton, Mal; Modelling and Simulation to Address NATO's New and Existing Military

Requirements; October 2004, pp. 11-1 - 11-11; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In order to explore the potential impact of novel command configurations, it is useful to have some means of extrapolating from existing systems and comparing the outcome of change from existing to novel systems. By taking a systems view of operations, it is possible to consider the impact of reconfiguration of the performance of the system and on the agents operating within the system. The aim of the WESTT analytical prototyping tool is to support system analysis and to allow the analyst to explore the impact of reconfiguration through the manipulation of models. In this paper we describe the requirements, development and initial prototype of the WESTT system and illustrate the use of the tool through an example drawn from emergency service operations.

Author

Human Factors Engineering; Support Systems; Extrapolation; Systems Analysis

20050192591 Science Applications International Corp., San Diego, CA, USA

XMSF as an Enabler for NATO M&

Morse, Katherine L.; Tolk, Andreas; Pullen, J. Mark; Brutzman, Don; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 13-1 - 13-19; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Extensible Modeling and Simulation Framework (XMSF) is defined as a modeling-&-simulation-tailored set of self-consistent standards, processes and practices employing a set of web-based technologies and services to enable a new generation of Internet-distributed applications to emerge, develop and interoperate. Many software systems that composably scale to worldwide scope utilize the World Wide Web. Therefore, it is evident that an extensible web-enabled framework offers great promise to scale up the capabilities of M&S systems to meet the needs of training, analysis, acquisition, and the operational warfighter. By embracing commercial web technologies as a shared-communications platform and a ubiquitous-delivery framework, NATO M&S can fully leverage the burgeoning commercial web services industry. XMSF has several high-level requirements derived from years of experience with M&S frameworks, and the challenges of their effective deployment across diverse networks and systems. XMSF must enable simulations to interact directly and scalably over a highly distributed network, achieved through compatibility between a web framework and networking technologies. XMSF must be equally usable by human and software agents. Clearly XMSF must support composable, reusable model components. XMSF use cannot be constrained by proprietary technology or legally encumbering patents which might discourage the free, open, ad hoc development of interconnected tactical models and simulations.

Author

Software Engineering; Training Analysis; World Wide Web; Internets; Models; Simulation

20050192593 NATO Consultation, Command, and Control Agency, The Hague, Netherlands

Modelling and Simulation of Asymmetric Operations to Support Operational Planning

Dompke, Uwe K. J.; Black, Samantha; Nonnenmacher, Wolfgang; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 2-1 - 2-18; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The paper will describe a basic approach to build a system based on an open architecture (GAMMA (Global Aggregated Model for Military Assessment). All interacting objects such as military units, assets, geographic objects and non-military elements such as refugees, civilian population, or civilian organisations (such as The Red Cross), infrastructure elements such as power plants or cities etc. can be defined and instantiated easily without requiring any program changes. All objects in the system can act as intelligent agents. A powerful newly developed order interpreter allows a flexible and user friendly input of strategies and orders to control the dynamic behaviour of the agents which can change during a simulation based on events and the outcome of interactions (e.g. collateral damage, information operations or psychological operations). Another newly developed feature is a statistics manager. This statistics manager can be used to display and analyse the results of a simulation run. It is very flexible and extendible to allow analysing the impact of specific recorded events (e.g demonstrations, riots, sniper attacks, demolishing of critical infrastructure) on parameters like the stability of a government. A prototype for a proof of concept of a model to describe the impact of events on a government s stability called ZETA (Zoran Sea Crisis Effects-based Tool for Analysis of Asymmetric operations) has been developed by NC3A and the Canadian Forces College.

Author

Architecture (Computers); Military Technology; Operational Problems; Dynamic Characteristics; Organizations; Planning

20050192598 Military Univ. of Technology, Warsaw, Poland

A Concept of Simulation Based Diagnostic Support Tool for Terrorism Threat Awareness

Najgebauer, Andrzej; Antkiewicz, Ryszard; Kulas, Wojciech; Pierzchala, Dariusz; Rulka, Jaroslaw; Tarapata, Zbigniew; Chmielewski, Mariusz; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 16-1 - 16-14; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A04, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

In this paper we will describe the concept for simulation based decision support tool for predicting possible terrorist activities. Described simulator will improve NATO s capabilities on predicting possible threats concerning terrorist activities as well as developing various campaigns for antiterrorism actions that could lead to efficient reactions on such situations. The idea of such simulator will be developed using HLA standard for simulation interoperability. An approach to information model development on the basis on current taxonomies of Early Warning Systems will be proposed. Example components of such database will be presented using Unified Modelling Language. Analytical database will be the part of the system on which the simulation scenarios will be developed. The simulation process will be based on models of asymmetric conflicts that derive data from analytical part of the system. Developed scenarios and possible antiterrorist activities will concern not only short term forecast but also will enable government institutions to prepare and take long term steps to deal with possible threats. This work is strictly connected with MSG 026 project of Early Warning System considering not only developing the tool itself but also reasoning procedures for knowledge bases.

Author

Terrorism; Early Warning Systems; Forecasting; Interoperability; Predictions; Decision Support Systems

20050192614 NASA Glenn Research Center, Cleveland, OH, USA

New Web Server - the Java Version of Tempest - Produced

York, David W.; Ponyik, Joseph G.; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A new software design and development effort has produced a Java (Sun Microsystems, Inc.) version of the award-winning Tempest software (refs. 1 and 2). In 1999, the Embedded Web Technology (EWT) team received a prestigious R&D 100 Award for Tempest, Java Version. In this article, 'Tempest' will refer to the Java version of Tempest, a World Wide Web server for desktop or embedded systems. Tempest was designed at the NASA Glenn Research Center at Lewis Field to run on any platform for which a Java Virtual Machine (JVM, Sun Microsystems, Inc.) exists. The JVM acts as a translator between the native code of the platform and the byte code of Tempest, which is compiled in Java. These byte code files are Java executables with a '.class' extension. Multiple byte code files can be zipped together as a "*.jar' file for more efficient transmission over the Internet. Today's popular browsers, such as Netscape (Netscape Communications Corporation) and Internet Explorer (Microsoft Corporation) have built-in Virtual Machines to display Java applets.

Derived from text

Applications Programs (Computers); Java (Programming Language); Software Engineering

20050195828 NASA Lewis Research Center, Cleveland, OH, USA

National Combustion Code, a Multidisciplinary Combustor Design System, Will Be Transferred to the Commercial Sector

Steele, Gynelle C.; Research and Technology 1998; April 1999; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The NASA Lewis Research Center and Flow Parametrics will enter into an agreement to commercialize the National Combustion Code (NCC). This multidisciplinary combustor design system utilizes computer-aided design (CAD) tools for geometry creation, advanced mesh generators for creating solid model representations, a common framework for fluid flow and structural analyses, modern postprocessing tools, and parallel processing. This integrated system can facilitate and enhance various phases of the design and analysis process.

Derived from text

Multidisciplinary Design Optimization; Computer Aided Design; Computer Programs; Combustion Chambers

20050195877 NASA Glenn Research Center, Cleveland, OH, USA

Onyx-Advanced Aeropropulsion Simulation Framework Created

Reed, John A.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Numerical Propulsion System Simulation (NPSS) project at the NASA Glenn Research Center is developing a new software environment for analyzing and designing aircraft engines and, eventually, space transportation systems. Its purpose is to dramatically reduce the time, effort, and expense necessary to design and test jet engines by creating sophisticated computer simulations of an aerospace object or system (refs. 1 and 2). Through a university grant as part of that effort, researchers at the University of Toledo have developed Onyx, an extensible Java-based (Sun Micro-systems, Inc.), objectoriented simulation framework, to investigate how advanced software design techniques can be successfully applied to aeropropulsion system simulation (refs. 3 and 4). The design of Onyx's architecture enables users to customize and extend the framework to add new functionality or adapt simulation behavior as required. It exploits object-oriented technologies, such as design patterns, domain frameworks, and software components, to develop a modular system in which users can dynamically replace components with others having different functionality.
Derived from text
Java (Programming Language); Computer Aided Design; Computer Programs; Object-Oriented Programming

20050196045 Eclectic Computing Concepts, Inc., McKinney, TX USA
Stegkit: Automated Steganalysis Tool
Bechtel, Robert J.; Rowe, Mike; Jun. 2005; 159 pp.; In English
Contract(s)/Grant(s): FA9550-04-C-0109
Report No.(s): AD-A434862; AFRL-SR-AR-TR-05-0246; No Copyright; Avail: CASI; A08, Hardcopy
Report developed under STTR contract for topic AF04-T008. There are many different techniques for hiding steganographic content and in theory, any file type can serve as a carrier. We developed a general-purpose steganalysis system that would handle many file types and many steganographic methods, while being easy to configure and use. We created a flexible, efficient framework, called StegKit, into which steganalysis components could be placed or 'plugged in' to carry out automated and manual analysis within common operating environments. The system was modeled on modern antivirus software, capable of background monitoring of files, email, and web pages visited in a browser. Our effort demonstrated the feasibility of a technical architecture featuring a centralized controller with plug-in components for file type detection and steganalysis.
DTIC
Computer Programs; Computer Storage Devices; Internets

20050196055 Army Engineer Research and Development Center, Vicksburg, MS USA
Use of the Hydrological Simulation Program - FORTRAN (HSPF) Model for Watershed Studies
Skahill, Brian E.; Sep. 2004; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434883; ERDC/TN SMART-04-1; No Copyright; Avail: Defense Technical Information Center (DTIC)
The objectives of this document are to provide a general description of the Hydrological Simulation Program - FORTRAN (HSPF) model, its capabilities and limitations, data requirements, traditional and innovative methods for HSPF hydrologic model calibration, and to present a case study HSPF model application whereby the capabilities of HSPF and its ancillary public domain, off-the-shelf software are demonstrated as a means to support system-wide modeling and assessment in a usable decision-support framework.
DTIC
Computer Programs; Fortran; Hydrology; Simulation; Watersheds

20050196056 Army Engineer Research and Development Center, Vicksburg, MS USA
Watershed Analysis with the Hydrologic Engineering Center's River Analysis System (HEC-RAS)
Goodell, Christopher R.; Brunner, Gary W.; Sep. 2004; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434884; ERDC/TN SMART-04-2; No Copyright; Avail: Defense Technical Information Center (DTIC)
The objectives of this document are to provide a general description of the HEC-RAS model, its capabilities and limitations, data requirements, traditional and innovative methods for HEC-RAS hydraulic model calibration, and to present a case study HEC-RAS model application whereby the capabilities of HEC-RAS are demonstrated as a means to support system-wide modeling and assessment in a usable decision-support framework.
DTIC
Computer Programs; Hydrology; Rivers; Watersheds

20050196060 Army Engineer Research and Development Center, Vicksburg, MS USA
The Ecosystem Functions Model: A Tool for Restoration Planning
Hickey, John T.; Dunn, Chris N.; Sep. 2004; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434891; ERDC/TN SMART-04-4; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Ecosystem Functions Model (EFM) is a planning tool that analyzes ecosystem response to changes in flow regime. The U.S. Army Corps of Engineers Hydrologic Engineering Center (HEC) is developing the EFM and envisions environmental planners, biologists, and engineers using the model to help determine whether proposed alternatives (e.g., reservoir operations or levee alignments) would maintain, enhance, or diminish ecosystem health. Project teams can use the EFM to visualize existing ecologic conditions, highlight promising restoration sites, and assess and rank alternatives according to the relative enhancement (or decline) of ecosystem aspects. This software is a general tool, applicable to a wide range of ecotypes and Corps projects.
DTIC
Computer Programs; Ecosystems; Restoration; Software Development Tools

20050196085 Army Engineer Research and Development Center, Vicksburg, MS USA
Longitudinal Loading and Nutrient Compositional Gradients in an Agriculturally Managed Watershed in West-Central Wisconsin
James, William F.; Ruiz, Carlos E.; Barko, John W.; Eakin, Harry L.; Sep. 2004; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434935; ERDC/TN SMART-04-7; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this research was to describe and quantify biologically labile and refractory nitrogen and phosphorus species, transformations, and loads along the longitudinal axis of a river draining an intensively managed agricultural watershed. Excessive nutrient runoff (primarily as phosphorus) in agriculturally managed watersheds is a primary cause for eutrophication of Corps of Engineers and other receiving waters. Because agricultural soils are often managed for crop uptake of nitrogen (N), rather than phosphorus (P), additions of fertilizers and manures have resulted in the buildup of soil P in excess of crop needs that can be transported to receiving waters during runoff (Lemunyon and Gilbert 1993, Sharpley et al. 1994, Sharpley 1995). In addition, watersheds managed for livestock (such as dairy operations) rely on frequent soil applications as a means of manure management that also results in the buildup of excessive nutrient levels in the soil. Simulation of N and P runoff via modeling is critical for the development of management scenarios to control excessive nutrient loading in agriculturally managed watersheds. However, algorithms need to be improved to more accurately predict transformations, transport, and fate of biologically labile nutrient forms that are either directly available for biological uptake or that can be recycled in receiving waters. Input data are also needed to verify these model improvements and predictions. The objectives of this study were to examine biologically labile and refractory N and P loadings, composition, and transformations in the agriculturally managed Upper Eau Galle River Watershed, located in west-central Wisconsin.
DTIC
Eutrophication; Phosphorus; Watersheds; Wisconsin

20050196091 Army Engineer Research and Development Center, Vicksburg, MS USA
Nutrient Loading Characteristics for Two Sub-watersheds Exhibiting Differing Agricultural Land-Use Practices
James, William F.; Ruiz, Carlos E.; Barko, John W.; Sep. 2004; 15 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434944; ERDC/TN SMART-04-8; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this research was to describe and quantify biologically labile and refractory nitrogen and phosphorus constituents, transformations, and loads in the runoff of two sub-watersheds exhibiting differing agricultural land-use practices. Runoff was impacted by intensive row-cropping for corn production in one of the watersheds while the other one was impacted by dairy livestock management.
DTIC
Agriculture; Land Use; Nitrogen; Phosphorus; Procedures; Watersheds

20050196100 Cornell Univ., Ithaca, NY USA
A Testbed for Highly-Scalable Mission Critical Information Systems
Birman, Kenneth P.; Jun. 2005; 4 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0263
Report No.(s): AD-A434953; 43058; AFRL-SR-AR-TR-05-0242; No Copyright; Avail: CASI; A01, Hardcopy

This effort is building a new system for scalable distributed computing. The basic problem is common in GIG and NCES systems, where an acute need has arisen for simple tools to assist the developer of a distributed service that will be shared by huge numbers of client systems in a networked environment. Headed by Professor Ken Birman, the project is exploring a novel fusion of classical protocols for reliable multicast communication with a new style of peer-to-peer protocol called scalable 'gossip'. The basic idea is to implement a communication platform using these new protocols, and then integrate the platform with standard Web Services tools and technologies to achieve a uniquely easy to use, scalable, and robust solution. The DURIP cluster has rapidly become a mainstay of the author's research in Quicksilver, to include scalable services architecture, time critical services, and scalable reliable event delivery. The cluster is anticipated to increase in usage over the next several years to include more members of the systems groups at Cornell University. QuickSilver currently has three sub-efforts that rely heavily on the cluster. The first project focuses on what is called a 'scalable services architecture.' This work explores a novel new approach to building high performance, scalable, self-managed distributed services that can be dragged and dropped onto the cluster. A second project adopts a similar approach but with a focus on time-critical services. Using a new form of forward error correction, this activity seems to support a new kind of time-critical or real-time replication technology that includes support for deadline-driven communication, periodic communication, and guaranteed low-latency responsiveness even in the face of load bursts or failures. A third project focuses on scalable reliable event delivery, messaging, and notification.
DTIC
Client Server Systems; Distributed Processing; Information Systems; Protocol (Computers); Software Development Tools; Test Stands

20050196122 Indiana Univ., Indianapolis, IN USA
A Framework for Seamless Interoperation of Heterogeneous Distributed Software Components
Raje, Rajeev R.; Olson, Andrew M.; Bryant, Barrett R.; Burt, Carol C.; Auguston, Mikhail; May 2005; 371 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0746
Report No.(s): AD-A434987; TR-CIS-0624-05; No Copyright; Avail: CASI; A16, Hardcopy

The UniFrame research was supported under the CIP/SW Program. The vision of this research is to automate the process of integrating heterogeneous and distributed systems that conform to specific quality requirements. This research addressed three key challenges : a) architecture-based interoperability, b) distributed resource discovery, and c) validation of quality requirements. Principles and prototypical systems were created to demonstrate the successful completion of the research.
DTIC
Computer Programs; Heterogeneity

20050196124 OR Concepts Applied, Whittier, CA USA
Large Number of Air Vehicles Simulation (LNAVSIM) Phase II Extension
Mar. 2005; 15 pp.; In English
Contract(s)/Grant(s): F33615-01-C-3116; Proj-A035
Report No.(s): AD-A434990; AFRL-VA-WP-TR-2005-3032; No Copyright; Avail: Defense Technical Information Center (DTIC)

Report developed under SBIR contract. The Large Number of Air Vehicles Simulation (LNAVSIM) has provided ORCA the opportunity to research and design software tools to model, plan, and simulate large numbers of air vehicles. The primary goal of LNAVSIM has been to model air war campaigns. LNAVSIM provides an environment in which operators are able to sit at consoles capable of controlling multiple air vehicles (a pod). The pod operator is responsible for allocating the vehicles under his/her control and planning paths for the vehicles to accomplish assigned objectives.
DTIC
Simulation; Software Development Tools; Warfare

20050196127 Michigan Univ., Ann Arbor, MI USA
Research in Architectural Approaches to the Integration of Empirical, Analytic and Episodic Learning within SOAR
Laird, John E.; May 2005; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-03-2-0261; DARPA ORDER-Q109; Proj-COGV
Report No.(s): AD-A434996; AFRL-IF-RS-TR-2005-171; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goal of this research as originally stated: We propose to greatly expand the use and usefulness of the Soar architecture.

Thus, our goal is to create a highly useable and available cognitive architecture that will greatly increase the use of cognitive architectures. To date, cognitive architectures have been either research or proprietary software. Soar has been one of the most successful cognitive architecture for developing knowledge-rich performance systems. We will greatly improve the development environment; develop a new, integrated debugger; expand and improve the tutorial and technical documentation; and provide training and support of the Soar architecture. All software will be freely available on SourceForge. During this project we have made significant progress in improving the Soar architecture and building a community. The major thrust of our work can be divided into three parts: 1. Evaluate the current state of Soar software, supporting documentation and tools. 2. Create a plan for future improvements to Soar and development of any new tools. 3. Make significant progress on the improvements to Soar and its associated tools and documentation.
DTIC
Artificial Intelligence; Programming Languages

20050196133 Rensselaer Polytechnic Inst., Troy, NY USA
Supporting Effects-Based Operations (EBO) with Information Technology Tools: Examining Underlying Assumptions of EBO Tool Development Practices
Triscari, Thomas; Wales, William J.; May 2005; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-03-2-0086; Proj-DS00
Report No.(s): AD-A435007; AFRL-IF-RS-TR-2005-179; No Copyright; Avail: Defense Technical Information Center (DTIC)

This effort examined, from both theoretical and empirical perspectives, major paradigms underlying the support of strategic decision processes in hyper-competitive environments. The primary research objectives were to (1) to develop a theoretic schema of approaches to strategic decision support, and (2) to provide an empirical research plan and detailed experimental design to assess the efficacy of the different paradigms. This final report identifies four major paradigms or 'schools of thought' of strategic decision support: autonomous, directive, predictive, and emergent. The proposed paradigms are offered to illustrate how recent EBO tool development approaches may be classified and subsequently characterized based upon their inherent gravitation to a particular decision support paradigm.
DTIC
Adaptation; Decision Theory; Information Systems; Models; Procedures; Software Development Tools

20050196140 Boeing Co., Saint Louis, MO USA
Aspect Suite Automation for Embedded Mission Systems
Ellis, Brian J.; Stankovic, John A.; Mar. 2005; 43 pp.; In English
Contract(s)/Grant(s): F33615-00-C-3048; Proj-A04I
Report No.(s): AD-A435021; AFRL-VA-WP-TR-2005-3029; No Copyright; Avail: Defense Technical Information Center (DTIC)

Aspect oriented programming (AOP), when used well, has many advantages. Aspects are however, programming-time constructs, i.e., they relate to source code. In this project, two types of design time aspects were identified, aspect checks and prescriptive aspects and these concepts were incorporated into a compositional toolkit: VEST. The VEST toolkit can substantially improve the development, implementation and evaluation of systems built from components which must interoperate, satisfy various dependencies, and meet non-functional requirements. The toolkit focuses on using language independent notions of aspects to deal with distributed embedded system issues that include application domain specific code, middleware, the OS, prescriptive aspects, and the hardware platform.
DTIC
Automatic Control; Embedding; Object-Oriented Programming; Programming Languages; Software Development Tools; Vests

20050196205 Northrop Grumman Corp., Rome, NY USA
Joint Synthetic Battlespace for Research and Development
Trott, Kevin C.; May 2005; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-98-D-0318-0045; Proj-487H
Report No.(s): AD-A435111; AFRL-IF-RS-TR-2005-177; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Joint Synthetic Battlespace for Research and Development (JSB-RD) is a distributed simulation environment that is

intended to facilitate research into both advanced Air Force command and control concepts and simulation science. The JSB-RD environment includes a computer generated forces (CGF) system, the JSB-RD Viewer, which provides theater-level situation awareness and mission status information in multiple formats, weather and environment simulations, a collection of sensor simulations, and a gateway(s) to C4ISR systems. A variety of AFRL/IF programs require a flexible, multi-purpose, modeling and simulation environment in order to represent various aspects of the joint battlespace, and to stimulate and react to prototype C4ISR systems and components. The JSB-RD system forms the starting point for such an environment. This effort focused on Visualization, System Integration and Modeling and Simulation Facility Planning. NG developed improvements and enhancements to the existing JSB-RD Viewer application to allow it to more effectively be used to evaluate and demonstrate advanced visualization and GUI techniques for theater-level situation awareness, integrated the enhanced JSB-RD Viewer application with the other major components of the JSB-RD federation, developed test and demonstration scenarios, and assessed how the existing JSB-RD system, and its individual components, could be used as the starting point for the development of a more complete C4ISR modeling and simulation environment.
DTIC
Computerized Simulation; Systems Integration

20050196239
High Confidence Reconfigurable Distributed Control
Hickey, Jason; Hauser, John; Murray, Richard; Apr. 2005; 44 pp.; In English
Contract(s)/Grant(s): F33615-98-C-3613; Proj-A04H
Report No.(s): AD-A435174; AFRL-VA-WP-TR-2005-3041; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Caltech/Colorado SEC project developed and tested two major advances in software enabled control: optimization-based control using real-time trajectory generation and logical programming environments for formal analysis of distributed control systems. These two activities, funded under the OCC and HSCC tasks of the SEC, were integrated and tested on the industry-led demonstration using the F-15 and T-33 flight tests.
DTIC
Active Control; Computer Programming; Control; Distributed Parameter Systems; Software Engineering

20050196262 Naval Postgraduate School, Monterey, CA USA
A Study of Initialization in Linux and OpenBSD
Dodge, Catherine; Irvine, Cynthia; Nguyen, Thuy; Feb. 2005; 16 pp.; In English
Report No.(s): AD-A435220; No Copyright; Avail: Defense Technical Information Center (DTIC)

The code that initializes a system can be notoriously difficult to understand. In secure systems, initialization is critical for establishing a starting state that is secure. This paper explores two architectures used for bringing an operating system to its initial state, once the operating system gains control from the boot loader. Specifically, the ways in which the OpenBSD and Linux operating systems handle initialization are dissected.
DTIC
Architecture (Computers); Security; Unix (Operating System)

20050196552 Ohio Aerospace Inst., OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Software Package Completed for Alloy Design at the Atomic Level
Bozzolo, Guillermo H.; Noebe, Ronald D.; Abel, Phillip B.; Good, Brian S.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

As a result of a multidisciplinary effort involving solid-state physics, quantum mechanics, and materials and surface science, the first version of a software package dedicated to the atomistic analysis of multicomponent systems was recently completed. Based on the BFS (Bozzolo, Ferrante, and Smith) method for the calculation of alloy and surface energetics, this package includes modules devoted to the analysis of many essential features that characterize any given alloy or surface system, including (1) surface structure analysis, (2) surface segregation, (3) surface alloying, (4) bulk crystalline material properties and atomic defect structures, and (5) thermal processes that allow us to perform phase diagram calculations. All the modules of this Alloy Design Workbench 1.0 (ADW 1.0) are designed to run in PC and workstation environments, and their operation and performance are substantially linked to the needs of the user and the specific application.
Author
Applications Programs (Computers); Alloys; Atomic Structure

20050196583 Naval Research Lab., Bay Saint Louis, MS USA

Through-the-Sensor Determination of AN/AQS-20 Sensor Performance Demonstration 1, December 13 through 17, 2004

Harris, Michael; Avera, William; Steed, Chad; Sample, John; Bibee, Leonard D.; Wood, Warren T.; Morgerson, Dave; Robinson, Christopher S.; Jun. 2005; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A435218; NRL/FR/7440--05-10; 106; No Copyright; Avail: Defense Technical Information Center (DTIC)

The first of three FY05 AN/AQS-20 Through-the-Sensor (TTS) Rapid Transition Process (RTP) demonstrations was successfully conducted on December 13 through 17, 2004, in the Mine Warfare Room at NAVOCEANO. The end-to-end demonstration took raw AN/AQS-20 Volume Search Sonar (VSS) and side scan sonar (SSS) data, processed, fused, and delivered them to the Mine Warfare Environmental Decision Aids Library (MEDAL) Tactical Decision Aid (TDA). This demonstration was a representative simulation that showed the connectivity and functionality using previously collected raw AN/AQS-20 Engineering Development Model (EDM) data with other overlapping historical datasets south of Panama City. In this demonstration, the datasets were processed and fused in a laboratory and placed locally in the Geophysical Database Variable Grid Dynamic (GDBV-D) and remotely on a Tactical Environmental Data Services (TEDServices) Gateway. Output formats were successfully ingested into a MEDAL installation using MEDAL's ftp interface. KTP Seafloor Bathymetric and Environmental Data (SeaBED) software worked as designed, data were sent and received in the correct formats, and SeaBED software did not interfere with the normal operation of the Bottom Mapping Workstation (BMW) software. This report summarizes the results of Demonstration 1 of the AN/AQS-20 RTP.

DTIC

Sonar; Computer Programs

20050196659 Analex Corp., Brook Park, OH, USA

Performance Evaluation of a Data Validation System

Wong, Edmond, Technical Monitor; Sowers, T. Shane; Santi, L. Michael; Bickford, Randall L.; June 2005; 18 pp.; In English

Contract(s)/Grant(s): NAS3-00145; WBS 22-794-20-12

Report No.(s): NASA/CR-2005-21383; E-15170; AIAA Paper 2005-4486; No Copyright; Avail: CASI; A03, Hardcopy

Online data validation is a performance-enhancing component of modern control and health management systems. It is essential that performance of the data validation system be verified prior to its use in a control and health management system. A new Data Qualification and Validation (DQV) Test-bed application was developed to provide a systematic test environment for this performance verification. The DQV Test-bed was used to evaluate a model-based data validation package known as the Data Quality Validation Studio (DQVS). DQVS was employed as the primary data validation component of a rocket engine health management (EHM) system developed under NASA's NGLT (Next Generation Launch Technology) program. In this paper, the DQVS and DQV Test-bed software applications are described, and the DQV Test-bed verification procedure for this EHM system application is presented. Test-bed results are summarized and implications for EHM system performance improvements are discussed.

Author

Management Systems; Data Systems; Performance Tests; Evaluation; Proving

20050196684 Cleveland State Univ., Cleveland, OH, USA

Rapid Prototyping Integrated With Nondestructive Evaluation and Finite Element Analysis

Abdul-Aziz, Ali; Baaklini, George Y.; Research and Technology 2000; March 2001; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Most reverse engineering approaches involve imaging or digitizing an object then creating a computerized reconstruction that can be integrated, in three dimensions, into a particular design environment. Rapid prototyping (RP) refers to the practical ability to build high-quality physical prototypes directly from computer aided design (CAD) files. Using rapid prototyping, full-scale models or patterns can be built using a variety of materials in a fraction of the time required by more traditional prototyping techniques (refs. 1 and 2). Many software packages have been developed and are being designed to tackle the reverse engineering and rapid prototyping issues just mentioned. For example, image processing and three-dimensional reconstruction visualization software such as Velocity2 (ref. 3) are being used to carry out the construction process of three-dimensional volume models and the subsequent generation of a stereolithography file that is suitable for CAD applications. Producing three-dimensional models of objects from computed tomography (CT) scans is becoming a valuable nondestructive evaluation methodology (ref. 4). Real components can be rendered and subjected to temperature and stress tests using structural engineering software codes. For this to be achieved, accurate high-resolution images have to be obtained via CT scans and then processed, converted into a traditional file format, and translated into finite element models. Prototyping

a three-dimensional volume of a composite structure by reading in a series of two-dimensional images generated via CT and by using and integrating commercial software (e.g. Velocity2, MSC/PATRAN (ref. 5), and Hypermesh (ref. 6)) is being applied successfully at the NASA Glenn Research Center. The building process from structural modeling to the analysis level is outlined in reference 7. Subsequently, a stress analysis of a composite cooling panel under combined thermomechanical loading conditions was performed to validate this process.
Author
Nondestructive Tests; Rapid Prototyping; Finite Element Method; Computer Aided Design; Three Dimensional Models

20050196775 Lawrence Livermore National Lab., Livermore, CA USA
Current Status of Radiation Transport Tools for Proliferation and Terrorism Prevention
Sale, K. E.; Sep. 17, 2004; 10 pp.; In English
Report No.(s): DE2005-15014575; UCRL-PROC-206614; No Copyright; Avail: Department of Energy Information Bridge
We present the current status and future plans for the set of calculational tools and data bases developed and maintained at LLNL. The calculational tools include the Monte Carlo codes TART and COG as well as the deterministic code ARDRA. In addition to these codes presently in use there is a major development effort for a new massively parallel transport code. An important part of the capability we're developing is a sophisticated user interface, based on a commercial 3-D modeling product, to improve the model development process. A major part of this user interface tool is being developed by Strela under the Nuclear Cities Initiative. Strela has developed a hub-and-spoke technology for code input interconversions (between COG, TART and MCNP) and will produce the plug-ins that extend the capabilities of the 3-D modeler for use as a radiation transport input generator. The major advantages of this approach are the built-in user interface for 3-D modeling and the ability to read a large variety of CAD-file formats.
NTIS
Prevention; Radiation Transport; Terrorism

20050196806 NASA Glenn Research Center, Cleveland, OH, USA
NASA Software of the Year, GENOAPFA, Given 2000 R and D 100 Award
Murthy, Pappu L. N.; Research and Technology 2000; March 2001; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy
GENOA-PFA, marketed currently by Alpha Star Corporation, is an enhanced commercial version of the Composite Durability Structural Analysis (CODSTRAN) computer program that was originally developed in-house at NASA Glenn Research Center specifically for polymer-matrix composite structures. Alpha Star Corporation and the University of Clarkson have made substantial developments to the code under the NASA Small Business Innovation Research and University Grant support. The code won the NASA Software of the year award in 1999 and was given the 2000 R&D 100 Award. The current GENOA-PFA can simulate the initiation and progression of damage, ultimately leading to global fracture in advanced composite structures under various loading and environmental conditions. It offers a number of capabilities beyond those of programs developed previously for similar purposes; these capabilities make GENOA-PFA preferable for use in analyzing the durability and damage tolerance of complex aero and space structures that have fiber reinforcements formed as two- and even three-dimensional weaves and braids.
Derived from text
Computer Systems Design; Computer Systems Performance; Software Engineering

20050196808 NASA Glenn Research Center, Cleveland, OH, USA
Transient Reliability Analysis Capability Developed for CARES/Life
Nemeth, Noel N.; Research nd Technology 2000; March 2001; 4 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy
The CARES/Life software developed at the NASA Glenn Research Center provides a general-purpose design tool that predicts the probability of the failure of a ceramic component as a function of its time in service. This award-winning software has been widely used by U.S. industry to establish the reliability and life of a brittle material (e.g., ceramic, intermetallic, and graphite) structures in a wide variety of 21st century applications.Present capabilities of the NASA CARES/Life code include probabilistic life prediction of ceramic components subjected to fast fracture, slow crack growth (stress corrosion), and cyclic fatigue failure modes. Currently, this code can compute the time-dependent reliability of ceramic structures subjected to simple time-dependent loading. For example, in slow crack growth failure conditions CARES/Life can handle sustained and linearly increasing time-dependent loads, whereas in cyclic fatigue applications various types of repetitive constant-amplitude loads can be accounted for. However, in real applications applied loads are rarely that simple but vary with time in more complex

ways such as engine startup, shutdown, and dynamic and vibrational loads. In addition, when a given component is subjected to transient environmental and or thermal conditions, the material properties also vary with time. A methodology has now been developed to allow the CARES/Life computer code to perform reliability analysis of ceramic components undergoing transient thermal and mechanical loading. This means that CARES/Life will be able to analyze finite element models of ceramic components that simulate dynamic engine operating conditions. The methodology developed is generalized to account for material property variation (on strength distribution and fatigue) as a function of temperature. This allows CARES/Life to analyze components undergoing rapid temperature change in other words, components undergoing thermal shock. In addition, the capability has been developed to perform reliability analysis for components that undergo proof testing involving transient loads. This methodology was developed for environmentally assisted crack growth (crack growth as a function of time and loading), but it will be extended to account for cyclic fatigue (crack growth as a function of load cycles) as well.
Derived from text
Computer Programs; Ceramics; Brittle Materials

20050198894 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Numerical Propulsion System Simulation Architecture
Naiman, Cynthia G.; June 24, 2004; 4 pp.; In English; 40th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 11-14 Jul. 2004, Fort Lauderdale, FL, USA
Contract(s)/Grant(s): WBS 22-302-15-20
Report No.(s): E-15198; No Copyright; Avail: CASI; A01, Hardcopy

The Numerical Propulsion System Simulation (NPSS) is a framework for performing analysis of complex systems. Because the NPSS was developed using the object-oriented paradigm, the resulting architecture is an extensible and flexible framework that is currently being used by a diverse set of participants in government, academia, and the aerospace industry. NPSS is being used by over 15 different institutions to support rockets, hypersonics, power and propulsion, fuel cells, ground based power, and aerospace. Full system-level simulations as well as subsystems may be modeled using NPSS. The NPSS architecture enables the coupling of analyses at various levels of detail, which is called numerical zooming. The middleware used to enable zooming and distributed simulations is the Common Object Request Broker Architecture (CORBA). The NPSS Developer's Kit offers tools for the developer to generate CORBA-based components and wrap codes. The Developer's Kit enables distributed multi-fidelity and multi-discipline simulations, preserves proprietary and legacy codes, and facilitates addition of customized codes. The platforms supported are PC, Linux, HP, Sun, and SGI.
Author
Computerized Simulation; Computer Programming; Programming Environments; Object-Oriented Programming; Numerical Analysis; Systems Simulation

20050198905 Pratt and Whitney Aircraft, USA
Pratt and Whitney Space Propulsion NPSS Usage
Olson, Dean; [2004]; 13 pp.; In English; 40th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 11-14 Jul. 2004, Fort Lauderdale, FL, USA
Contract(s)/Grant(s): NAS3-01138; NAS3-01122; WBS 22-794-20-5A
Report No.(s): E-14760; No Copyright; Avail: CASI; A03, Hardcopy

This talk presents Pratt and Whitney's space division overview of the Numerical Propulsion System Simulation (NPSS). It examines their reasons for wanting to use the NPSS system, their past activities supporting its development, and their planned future usage. It also gives an overview how different analysis tools fit into their overall product development.
Author
Computerized Simulation; Computer Programs; Spacecraft Propulsion; Programming Environments

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20050188567 Space and Naval Warfare Systems Center, San Diego, CA USA
Strategies for Optimizing Bandwidth Efficiency
Landers, Todd; Aug. 2001; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434120; No Copyright; Avail: CASI; A02, Hardcopy

To optimize bandwidth efficiency, the natural limitations of each network-supported data type must be overcome or mitigated. This paper discusses issues affecting bandwidth efficiency through the U.S. Navy's bandwidth-constrained wide-area network (WAN). The paper details the prevalent data types found in the naval environment and describes the characteristics associated with each data type. Commercial, standards-based link layer protocols that have widespread application in Navy networks also are described. Finally, forward error correction and issues surrounding bandwidth efficiency are discussed. As with all aspects of an engineered solution, engineers must chose the best tools to confront each aspect of the link design. Because of the economics and maturity of the technology, Ethernet is a clear choice in the local area networks, but falls short in the wide area. Point-to-Point Protocol (PPP) is a good choice if all of the applications supported by the network are Internet Protocol-based, but PPP falls short for a general-purpose network that supports various data types. With the technology currently available, Asynchronous Transfer Mode (ATM) is the only technology discussed that can support a truly converged network supporting voice, video, data, and legacy applications. Figure 4 shows the dynamic bandwidth allocation achieved using ATM for the WAN.
DTIC
Bandwidth; Optimization; Protocol (Computers); Wide Area Networks

20050188568 Space and Naval Warfare Systems Center, San Diego, CA USA
C4ISR Imperatives -- Cornerstones of a Network-Centric Architecture
Fuzak, Clancy; Carper, William L.; Gmitruk, Mary; Aitkenhead, James W.; Mattoon, Tom; Monteleon, Victor J.; Aug. 2001; 9 pp.; In English
Report No.(s): AD-A434121; No Copyright; Avail: CASI; A02, Hardcopy

Network-centric operations are military operations that fully exploit the availability of 'universal' connectivity. Much discussion of network-centric operations focuses on envisioning future applications of the connectivity. These future applications are a confederation of pieces, not a single unit. The prerequisite for fielding these pieces is an in-place network-centric architecture that can support their implementation. SSC San Diego has identified seven command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) imperatives that represent command capabilities needed by military forces. Network-centric architecture requires effectively achieving five of these imperatives. This paper argues the importance of these five, and suggests the value of building technologies to enable these imperatives. This approach allows clearer understanding of the application of technology while assuring consistency with the end objective of network-centric operations. SSC San Diego has identified a set of seven command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) imperatives. These imperatives represent command capabilities that have been needed by military forces throughout history and are expected to continue to be needed in the future. While the imperatives are time-independent, the degree to which they can be achieved depends upon available technology. The imperatives are as follows: Dynamic Interoperable Connectivity, Universal Information Access, Focused Sensing and Data Collection, Consistent Situation Representation, Information Operations Assurance, and Resource Planning and Management.
DTIC
Command and Control; Communication Networks; Computer Networks; Military Operations

20050188613 Protean Devices, Inc., Cary, NC USA
Data Compression and Network Processing for Polymorphous Computing Architecture (PCA)
Edwards, J. M.; Franzon, Paul D.; Conte, Thomas M.; Kanaujia, Shobhit; Aldwairi, Monther; Yadav, Meeta; Iyer, Balaji V.; Feb. 2005; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-03-C-4107; Proj-P364
Report No.(s): AD-A434236; AFRL-IF-WP-TR-2005-1519; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this project was to explore the appropriateness of the University of Texas at Austin's TRIPS architecture for Embedded/Networking applications in a polymorphic computing setting. This involved developing an Embedded/Networking Morph mode for TRIPS, or EN-Morph. Early studies found that key architectural features of TRIPS would need to be rethought since TRIPS is geared towards high productivity computing. Goals of embedded computing contrasted with high productivity computing in areas such as cost, power consumption, etc. In reaction, the EN-Morph team developed an embedded TRIPS architecture that was appropriate for embedded/networking, and then fed these ideas to the TRIPS team. In the end, CLAW, a scalable, synthesizeable TRIPS core processor with low power characteristics, and two hardware accelerators to off-load the core from compute-intensive tasks were created. A set of networking benchmarks for the entire DARPA Polymorphous Computing Architectures (PCA) program was also created that encourage networking aspects to be considered in PCA designs.
DTIC
Architecture (Computers); Data Compression; Polymorphism

20050188662 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Passwords: A Survey on Usage and Policy

Martinson, Kurt W.; Mar. 2005; 74 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434309; AFIT/GIR/ENV/05M-11; No Copyright; Avail: CASI; A04, Hardcopy

Computer password use is on the rise. Passwords have become one of the primary authentication methods used today. It is because of their high use that organizations have started to place parameters on passwords. Are password restrictions a nuisance? What are some of the consequences that result as organizations place the burden of their computer security on passwords? This thesis analyzes the results of a survey instrument that was used to determine if individuals are using similar techniques or patterns when choosing or remembering their passwords. It also looks at how individuals feel about using passwords. In addition, the authors examine the literature to determine the importance of choosing strong passwords. This study reveals some critical issues associated with password choice: many respondents feel that organizational parameters are a nuisance, many respondents still write their passwords down, over 70% of respondents must remember more than five passwords, and many individuals are using the same password for multiple applications. The authors see a need for organizations to minimize the number of passwords individuals must remember. The survey results show that the intent of password policy is not being followed, and the authors contend that overlooking this finding is a serious threat to the future of computer security.

DTIC

Access Control; Computer Information Security; Numerical Control; Policies; Selection; Surveys

20050188673 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

An Historical Analysis of Factors Contributing to the Emergence of the Intrusion Detection Discipline and its Role in Information Assurance

Hart, James L. M.; Mar. 2005; 81 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434323; AFIT/GIR/ENV/05M-06; No Copyright; Avail: CASI; A05, Hardcopy

In 2003, Gartner, Inc., predicted the inevitable demise of the intrusion detection (ID) market, a major player in the computer security technology industry. In light of this prediction, IT executives need to know if intrusion detection technologies serve a strategic purpose within the framework of information assurance (IA). This research investigated the historical background and circumstances that led to the birth of the intrusion detection field and explored the evolution of the discipline through current research in order to identify appropriate roles for IDS technology within an information assurance framework. The research identified factors contributing to the birth of ID including increased procurement and employment of resource-sharing computer systems in the DoD, a growing need to operate in an open computing environment while maintaining security and the unmanageable volume of audit data produced as a result of security requirements. The research also uncovered six trends that could be used to describe the evolution of the ID discipline encompassing passive to active response mechanisms, centralized to distributed management platforms, centralized to distributed/agent-based detection, single to multiple detection approaches within a system, host-based to network to hybrid analysis and software-based to hardware-based/in-line devices. Finally, the research outlined three roles suitable for IDS to fulfill within the IA framework including employing IDS as a stimulus to incident response mechanisms, as a forensic tool for gathering evidence of computer misuse and as a vulnerability assessment or policy enforcement facility.

DTIC

Detection; Histories; Warning Systems

20050188682 Princeton Univ., NJ USA

Scaling Proof-Carrying Code to Production Compilers and Security Policies

Appel, Andrew W.; Felton, Edward W.; Walker, David P.; Shao, Zhong; Trifonov, Valery; Apr. 2005; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-99-1-0519; DARPA ORDER-H559; Proj-H559

Report No.(s): AD-A434335; AFRL-IF-RS-TR-2005-153; No Copyright; Avail: CASI; A03, Hardcopy

We have developed high-assurance software protection mechanisms that can be used in component-software platforms (virtual machines such as Sun's Java or Microsoft's .Net). The idea is to leverage type-safe source languages to get fine-grained protection at the level of individual object fields and methods. The obstacle to be overcome was the inherent complexity of virtual machine implementations, particularly their just-in-time compiler, before installing that output for execution. We have successfully shown how to integrate this technology into the compiler, and how to conduct formal, automated verification of the protection mechanism. We have also developed a technology for distributed authentication and public key distribution, called 'proof-carrying authentication.' This allows many participants with different goals, different

policies, and even different policy languages, to cooperate in authenticating each other (and third parties). Finally, we have started a seedling effort in policy-based network management.
DTIC
Compilers; Policies; Proving; Security

20050188719 Air Univ., Maxwell AFB, AL USA
Leaks in the National Information Infrastructure Dam: Who Should Protect It?
Piontkowsky, Curtis O.; Apr. 2004; 65 pp.; In English
Report No.(s): AD-A434393; AU/SCHOOL/NNN/2004-04; No Copyright; Avail: CASI; A04, Hardcopy

Is our interconnected, electronic media and communications system so pervasive, so entwined in our national defense, our economy, and our way of life that its demise would bring down the nation? What responsibilities does the government have for protecting this 'environment"? This paper examines the following: (1) the responsibilities of government, (2) why the national information infrastructure needs protecting, (3) what the nation has done in terms of protection, and (4) the nation's options for the future. Rapid growth and commercialization since the Internet's inception, and an under appreciation for security opened the flood gates for problems from fraud and theft to defacements, disruptions, and denial of service attacks. For the national information infrastructure to sustain its crucial position in a wide range of essential activities, it must be secure physically and electronically. This study reviews government's role and responsibilities for policy, security, standards, laws, and partnerships with the private sector. The author's assessment is that the governmental policy framework is well established, security is being pushed to the forefront of national consciousness, and standards continue to evolve. Legislation placing additional responsibility and liability for Internet security upon software and hardware developers, Internet service providers, corporations, and individuals may be a prudent next step. Simultaneously, government should complement legislation with incentives (e.g., tax breaks and subsidies) to encourage the private sector to establish and maintain a secure environment for essential Internet activities to operate.
DTIC
Internets; Leakage; Policies; Protection; Security; United States

20050188845 Naval Postgraduate School, Monterey, CA USA
A Very Compact Rijndael S-box
Canright, D.; May 2005; 71 pp.; In English
Report No.(s): AD-A434781; NPS-MA-05-001; No Copyright; Avail: Defense Technical Information Center (DTIC)

One key step in the Advanced Encryption Standard (AES), or Rijndael, algorithm is called the 'S-box', the only nonlinear step in each round of encryption/decryption. A wide variety of implementations of AES have been proposed, for various desiderata, that effect the S-box in various ways. In particular, the most compact implementation to date of Satoh et al. performs the 8-bit Galois field inversion of the S-box using subfields of 4 bits and of 2 bits. This work describes a refinement of this approach that minimizes the circuitry, and hence the chip area, required for the S-box. While Satoh used polynomial bases at each level, we consider also normal bases, with arithmetic optimizations; altogether, 432 different cases were considered. The isomorphism bit matrices are fully optimized, improving on the 'greedy algorithm.' The best case reduces the number of gates in the S-box by 20%. This decrease in chip area could be important for area-limited hardware implementations, e.g., smart cards. And for applications using larger chips, this approach could allow more copies of the S-box, for parallelism and/or pipelining in non-feedback modes of AES.
DTIC
Algorithms; Cryptography

20050192522 Belgian Royal Observatory, Brussels, Belgium
The EUREF Permanent Network in 2002
Bruyninx, C.; Habrich, H.; Soehne, W.; Weber, G.; Kenyeres, A.; Stangl, G.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 119-123; In English; See also 20050192500; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The EUREF Permanent Network (EPN) consists of GPS tracking stations, data centers and analysis centers organized following a similar hierarchy as the IGS and based on voluntary contributions.
Author
Global Positioning System; Network Analysis; Tracking Stations

20050192524 Geoscience Australia, Canberra, Australia
Geoscience Australia RNAAC
Luton, Geoffrey; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 125-126; In English; See also 20050192500; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The RNAAC function of routinely processing all stations in the Australian Regional GPS Network (ARGN) continued during 2002. The weekly combined SINEX result files were submitted to the Crustal Dynamics Data Information System (CDDIS).
Author
Geodynamics; Geophysics; Information Systems

20050192526 Geographical Survey Inst., Japan
GSI RNAAC
Yamaguwa, A.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 127-128; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Since 1996, Geographical Survey Institute (GSI) has been contributing as a Regional Network Associate Analysis Center (RNAAC). The network for the GSI's analysis consists of 10 IGS global sites and 7 domestic GPS sites.
Author
Global Positioning System; Network Analysis

20050192528 Deutsches Geodaetisches Forschungsinstut, Munich, Germany
IGS RNAAC SIR
Seemueller, Wolfgang; Drewes, Hermann; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 129-131; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Changes in the RNAAC SIR station network and a new solution for coordinates and velocities are presented in this report. Additionally the impact of an earthquakes near Manzanillo (Mexico) on the weekly coordinate solutions and the velocity estimates are shown. The processing strategy is updated to include the influence of ocean loading.
Author
Shuttle Imaging Radar; Earthquakes; Networks

20050194579 NASA Langley Research Center, Hampton, VA, USA, Phoenix Integration, Blacksburg, VA, USA
A Parallel Trade Study Architecture for Design Optimization of Complex Systems
Kim, Hongman; Mullins, James; Ragon, Scott; Soremekun, Grant; Sobieszczanski-Sobieski, Jaroslaw; [2005]; 10 pp.; In English; 46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 18-21 Apr. 2005, Austin, TX, USA; Original contains color illustrations
Contract(s)/Grant(s): NNL04AA10C; 23-062-10-04
Report No.(s): AIAA Paper 2005-2201; No Copyright; Avail: CASI; A02, Hardcopy

Design of a successful product requires evaluating many design alternatives in a limited design cycle time. This can be achieved through leveraging design space exploration tools and available computing resources on the network. This paper presents a parallel trade study architecture to integrate trade study clients and computing resources on a network using Web services. The parallel trade study solution is demonstrated to accelerate design of experiments, genetic algorithm optimization, and a cost as an independent variable (CAIV) study for a space system application.
Author
Complex Systems; Aerospace Systems; Experiment Design; Architecture (Computers); Genetic Algorithms; Multidisciplinary Design Optimization; Parallel Processing (Computers)

20050195826 NASA Lewis Research Center, Cleveland, OH, USA
Virtual Interactive Classroom: A New Technology for Distance Learning Developed
York, David W.; Babula, Maria; Research and Technology 1998; April 1999; 3 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Virtual Interactive Classroom (VIC) allows Internet users, specifically students, to remotely control and access data

from scientific equipment. This is a significant advantage to school systems that cannot afford experimental equipment, have Internet access, and are seeking to improve science and math scores with current resources. A VIC Development Lab was established at Lewis to demonstrate that scientific equipment can be controlled by remote users over the Internet. Current projects include a wind tunnel, a room camera, a science table, and a microscope.
Derived from text
Educational Resources; Internet Resources; Remote Control

20050196059 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
National Security Agency (NSA) Systems and Network Attack Center (SNAC) security Guides Versus Known Worms
Sullivan, Matthew W.; Mar. 2005; 59 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434889; AFIT/GIA/ENG/05-07; No Copyright; Avail: Defense Technical Information Center (DTIC)

Internet worms impact Internet security around the world even though there are many defenses to prevent the damage they inflict. The National Security Agency (NSA) Systems and Network Attack Center (SNAC) publishes in-depth configuration guides to protect networks from intrusion; however, the effectiveness of these guides in preventing the spread of worms hasn't been studied. This thesis establishes how well the NSA SNAC guides protect against various worms and exploits compared to Microsoft patches alone. It also identifies the aspects of the configuration guidance that is most effective in the absence of patches and updates, against network worm and e-mail virus attacks. The results from this thesis show that the Microsoft patches and the NSA SNAC guides protect against all worms and exploits tested. The main difference is NSA SNAC guides protected as soon as they were applied where as the Microsoft patches needed to be written, distributed and applied in order to work. The NSA SNAC guides also provided protection by changing default permissions and passwords some worms and exploits use to exploit the computer as well as removed extraneous packages that could have undiscovered exploits.
DTIC
Computer Viruses; Intrusion; Safety Devices; Security; Warning Systems; Worms

20050196101 Army Research Lab., Aberdeen Proving Ground, MD USA
Results From Measuring the Performance of the NAS Benchmarks on the Current Generation of Parallel Computers and Observations Drawn From These Measurements
Pressel, Daniel; May 2005; 16 pp.; In English
Report No.(s): AD-A434956; ARL-RP-96; No Copyright; Avail: Defense Technical Information Center (DTIC)

The NAS Division at NASA Ames Research Center has developed a highly respected and widely used set of benchmarks for parallel computers. These benchmarks are based on the needs of computational fluid dynamics applications but appear to have reverance to other disciplines as well. Unfortunately NAS last published a collection of results for a wide range of system's in November of 1997. Given the rapid level of change in the field of computers in general and high performance parallel computing it seemed appropriate to try and fill in some of the gaps. As such the major computational assets of the ARL-MSRC are being benchmarked with the intent to publish the results on an ARL website. While making these measurements several observations and conclusions were drawn. These observations and conclusions will be discussed at length in d%is document.
DTIC
Parallel Computers

20050196242 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Study to Determine Damage Assessment Methods or Models on Air Force Networks
Thiem, Lisa S.; Mar. 2005; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435179; AFIT/GIR/ENV/05M-18; No Copyright; Avail: Defense Technical Information Center (DTIC)

Damage assessment for computer networks is a new area of interest for the Air Force. Previously, there has not been a concerted effort to codify damage assessment or develop a model that can be applied in assessing damage done by criminals, natural disasters, or other methods of damaging a computer network. The research undertaken attempts to identify if the Air Force MAJCOM Network Operations Support Centers (NOSC) use damage assessment models or methods. If the Air Force does use a model or method, an additional question of how the model was attained or decided upon is asked. All information comes from interviews, via e-mail or telephone, of managers in charge of computer security incidents at the Major Command level. The research is qualitative, so there are many biases and opportunities for additional, more research. Currently, there is some evidence to show that several Network Operations Support Centers are using some form of damage assessment,

however, each organization has highly individualized damage assessment methods that have been developed internally and not from a re-producible method or model.
DTIC
Computer Networks; Damage Assessment

20050196246 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Simple Public Key Infrastructure Protocol Analysis and Design
Vidergar, Alexander G.; Mar. 2005; 73 pp.; In English
Report No.(s): AD-A435185; AFIT/GCE/ENG/05-07; No Copyright; Avail: Defense Technical Information Center (DTIC)

Secure electronic communication is based on secrecy, authentication and authorization. One means of assuring a communication has these properties is to use Public Key Cryptography (PKC). The framework consisting of standards, protocols and instructions that make PKC usable in communication applications is called a Public Key Infrastructure (PKI). This thesis aims at proving the applicability of the Simple Public Key Infrastructure (SPKI) as a means of PKC. The strand space approach of Guttman and Thayer is used to provide an appropriate model for analysis. A Diffie-Hellman strand space model is combined with mixed strand space proof methods for proving the correctness of multiple protocols operating in the same context. The result is the public key mixed strand space model. This model is ideal for the analysis of SPKI applications operating as sub-protocols of an implementing application. This thesis then models the popular Internet Transport Layer Security (TLS) protocol as a public key mixed strand space model. The model includes the integration of SPKI certificates. To accommodate the functionality of SPKI, a new protocol is designed for certificate validation, the Certificate Chain Validation Protocol (CCV). The CCV protocol operates as a sub-protocol to TLS and provides online certificate validation. The security of the TLS protocol integrated with SPKI certificates and subprotocols is then analyzed to prove its security properties.
DTIC
Cryptography; Protocol (Computers); Security

20050196254 Industrial Coll. of the Armed Forces, Washington, DC USA
Information Technology Industry 2004
Altieri, Richard; Buccheit, Nathan; Burke, Kyle; Dillard, Norvel; Dolan, Patrick; Edwards, Gregory; Elins, Daniel; Gaines, Leonard; Goodwin, Steven; Lawrence, Michael; Jan. 2004; 49 pp.; In English
Report No.(s): AD-A435198; No Copyright; Avail: Defense Technical Information Center (DTIC)

Forging an unprecedented partnership between the public and private sectors is essential to protect the vital interests of the USA in the wake of the ongoing Information Technology Revolution. This study will define the Information Technology Industry, give an overview of current domestic and international conditions, and then analyze the state of national network security and challenges faced by the U.S. government and U.S. and international businesses and corporations in building a secure, yet productive and innovative partnership. Particular emphasis will be placed on industry issues with national security implications.
DTIC
Computers; Data Processing; Economics; Forecasting; Industries; Information Systems; Security; United States

20050198904 NASA Glenn Research Center, Cleveland, OH, USA
Extending Grid Computing to Remote Locations
Griffin, Robert; Vickerman, Mary; Lopez, Isaac; Siebert, Marc; [2003]; 9 pp.; In English; Supercomputing 2003, 17-21 Nov. 2003, Phoenix, AZ, USA
Contract(s)/Grant(s): WBS 22-305-15-40
Report No.(s): E-14758; No Copyright; Avail: CASI; A02, Hardcopy

NASA Glenn Research Center, in cooperation with NASA Ames and geologists from the University of Cincinnati and Bowling Green State University has extended the computational capabilities of the information Power Grid to remote research sites. The combination of satellite (EOS) data acquisition and the IPG processing provides geologists with the ability to identify the key mineralogical features at the research site. The underlying connectivity for this research environment is provided by the Numerical Research and Education Network (NREN) using a combination of terrestrial and mobile satellite-based networking solutions. Our approach not only speeds the process of scientific discovery, but also serves as a simple demonstration of NASA's capacity for geological classification and exploration of remote sites such as the Martian surface. The NASA Glenn Demonstrations combines satellite (EOS) data acquisition and the computational capabilities or the

Information Power Grid (IPG) to provide geologists with the ability to identify key mineralogical features in near real-time of an area in study. This capability could someday allow geological classification of rocks and minerals of remote sites such as the Martian surface.
Author
Grid Computing (Computer Networks); Geological Surveys; Remote Regions

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CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20050188769 CHI Systems, Inc., Fort Washington, PA USA
Terrain Analysis for Human-Robot Interaction (TAH-RI): Enabling Terrain Understanding to Improve Tactical Behavior
Hicinbothom, Jim; Riddle, Dawn; Graves, Ken; Murphy, Robin; Apr. 2005; 61 pp.; In English
Contract(s)/Grant(s): W74V8H-04-P-0482
Report No.(s): AD-A434525; TR-04018.050208; ARI-TR-2005-04; No Copyright; Avail: CASI; A04, Hardcopy

Terrain has a big impact on how battlefield situations unfold primarily because of its effects on observability, mobility, and restriction of fields of fire. As armed forces of the information age come within each other's sensor coverage, information about them is rapidly conveyed to their opponents. Terrain imposes constraints and opens opportunities for the creative use of Battlefield Operating Systems (BOS) and the capabilities and limitations of available troops, vehicles, systems, and materiel. Thus, understanding terrain, and its tactical import is essential for a force to succeed in its missions. Future Force Warrior (FFW) and Future Combat Systems (FCS) initiatives are developing advanced functional capabilities to aid Soldiers in operations to control and hold ground. Adding robotic vehicles, sensors, and weapons creates a planning and coordination challenge for commanders, and highlights the need for autonomous robotic systems that effectively 'understand' the tactical import of terrain and integrate that understanding into their situation awareness and behavior-generation processes. TAH-RI is reusable component software providing means of increasing readiness of Soldiers (e.g., in training and performance support systems) to integrate terrain understanding into battlefield decision-making processes, and means of enabling more autonomy in robots through terrain understanding for tactical behavior generation.
DTIC
Intelligence; Robotics; Robots; Terrain; Terrain Analysis

20050195829 NASA Glenn Research Center, Cleveland, OH, USA
Cascade Optimization Strategy with Neural Network and Regression Approximations Demonstrated on a Preliminary Aircraft Engine Design
Hopkins, Dale A.; Patnaik, Surya N.; Research and Technology 1999; March 2000; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

A preliminary aircraft engine design methodology is being developed that utilizes a cascade optimization strategy together with neural network and regression approximation methods. The cascade strategy employs different optimization algorithms in a specified sequence. The neural network and regression methods are used to approximate solutions obtained from the NASA Engine Performance Program (NEPP), which implements engine thermodynamic cycle and performance analysis models. The new methodology is proving to be more robust and computationally efficient than the conventional optimization approach of using a single optimization algorithm with direct reanalysis. The methodology has been demonstrated on a preliminary design problem for a novel subsonic turbofan engine concept that incorporates a wave rotor as a cycle-topping device. Computations of maximum thrust were obtained for a specific design point in the engine mission profile. The results (depicted in the figure) show a significant improvement in the maximum thrust obtained using the new methodology in comparison to benchmark solutions obtained using NEPP in a manual design mode.
Author
Neural Nets; Regression Analysis; Engine Design; Design Optimization; Cascade Control

20050195920 Massachusetts Inst. of Tech., Cambridge, MA USA
Towards Pervasive Robotics
Arsenio, Artur M.; Jan. 2003; 2 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT-63-00-C-10102
Report No.(s): AD-A434676; No Copyright; Avail: Defense Technical Information Center (DTIC)

In the near future, pervasive robotics will require small, light, and cheap robots that exhibit complex behaviors. These demands led to the development of the M2-M4 Macaco project -- a robotic active vision head. Macaco is a portable system, capable of emulating the head of different creatures both aesthetically and functionally. It integrates mechanisms for social interactions, autonomous navigation, and object analysis.
DTIC
Bionics; Image Processing; Portable Equipment; Robotics; Robots

20050195921 Massachusetts Inst. of Tech., Cambridge, MA USA
Investigating Models of Social Development Using a Humanoid Robot
Scassellati, Brian; Jan. 1998; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434679; No Copyright; Avail: Defense Technical Information Center (DTIC)

The evaluation of models of social and behavioral development is difficult in natural settings; ethical concerns, difficulties in implementing experimental procedures, and difficulties in isolating hypothesized variables make experimental evidence difficult or impossible to obtain. We propose the use of human-like robots as a testbed for the evaluation of models of human social development. Robotic implementation of human social models allows for unique opportunities to evaluate those models. In this paper, we review some of the implications of this proposal by examining a case study of an on-going project to implement an existing model of one aspect human social development, the development of joint attention behaviors.
DTIC
Human Relations; Robots; Test Stands

20050195922 Massachusetts Inst. of Tech., Cambridge, MA USA
First Contact: an Active Vision Approach to Segmentation
Fitzpatrick, P.; Jan. 2002; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434680; No Copyright; Avail: Defense Technical Information Center (DTIC)

How a robot should grasp an object depends on its size and shape. Such parameters can be estimated visually, but this is fallible, particularly for unrecognized, unfamiliar objects. Failure will result in a clumsy grasp or glancing blow against the object. If the robot does not learn something form the encounter, then it will be apt to repeat the same mistake again and again. This paper shows how to recover information about an object's extent by poking it, either accidentally or deliberately. Poking and object makes it move, and motion is a powerful cue for visual segmentation. The periods immediately before and after the moment of impact turn out to be particularly information, and give visual evidence for the boundary of the object that is well suited to segmentation using graph cuts. The segmentation algorithm is shown to produce results consistent enough to support autonomous collection of datasets for object recognition, which enables often-encountered objects to be segmented without the need for further poking.
DTIC
Robots; Segments; Visual Perception

20050195923 Massachusetts Inst. of Tech., Cambridge, MA USA
Learning Task Sequences from Scratch: Applications to the Control of Tools and Toys by a Humanoid Robot
Arsenio, Artur M.; Jan. 2004; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434681; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goal of this work is to build perceptual and motor control systems for a humanoid robot, starting from an infant's early ability for detecting repetitive or abruptly varying world events from human-robot interactions, and walking developmentally towards robust perception and learning. This paper presents strategies for learning task sequences from human-robot interaction cues. Demonstration by human teachers facilitates robot learning to recognize new objects, such as tools or toys, and their functionality. Self-exploration of the world extends the robot's knowledge concerning object properties.

Multi-modal percepts are then acquired and recognized by robotic manipulation of toys and tools.
DTIC
Control; Learning; Robots; Sequencing; Tasks

20050195924 Massachusetts Inst. of Tech., Cambridge, MA USA
Object Segmentation through Human-Robot Interactions in the Frequency Domain
Arsenio, Artur M.; Jan. 2003; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT-63-00-C-10102
Report No.(s): AD-A434686; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents a new embodied approach for object segmentation by a humanoid robot. It relies on interactions with a human teacher that drives the robot through the process of segmenting objects from arbitrarily complex, nonstatic images. Objects from a large spectrum of different scenarios are successfully segmented by the proposed algorithms. The paper discusses embodied object segmentation; detection of events in the frequency domain, including event detection, tracking, and multi-scale periodic detection; segmentation by passive demonstration; segmentation through active actuation; segmentation by poking; experimental results for object segmentation in terms of robustness; and conclusions and future work.
DTIC
Computer Vision; Frequencies; Image Processing; Machine Learning; Robots; Segments; Visual Perception

20050195925 Genoa Univ., Genoa, Italy
Development of the 'Mirror System': A Computational Model
Metta, Giorgio; Natale, Lorenzo; Rao, Satyajit; Sandini, Giulio; Jan. 2002; 1 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT-63-00-C-10102
Report No.(s): AD-A434687; No Copyright; Avail: Defense Technical Information Center (DTIC)

The authors are studying the development of the mirror system from a computational perspective with the ultimate goal of realizing a physical implementation. They are using an anthropomorphic robot as a development platform. The body of the robot provides the physical interaction between the computational structure and the environment. Single neuron recording and microstimulation in the monkey have shown that the premotor cortex contains visually responsive neurons. These neurons are thought to encode visual characteristics of objects in motor terms. For example, area F5 contains neurons that respond both when the monkey grasps an object and when it only fixates on the object (canonical neurons). Regardless of the intention of actually performing that particular motor act, the brain keeps a representation of the potential motor act. F5 also contains another class of visuomotor responsive cells called 'mirror neurons.' They too fire when manipulating an object by also when one is watching someone else performing the same manipulation. However, pretending to do the gesture does not make the neurons fire; the action has to be goal-directed. F5 can be imagined as the result of a two-stage process. The paper also lists the visual competencies and motor behaviors that have already been implemented.
DTIC
Bionics; Cerebral Cortex; Computer Vision; Visual Perception; Visual Stimuli

20050195926 Massachusetts Inst. of Tech., Cambridge, MA USA
Shoes as a Platform for Vision
Fitzpatrick, Paul; Kemp, Charles C.; Jan. 2003; 4 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT-63-00-C-10102
Report No.(s): AD-A434688; No Copyright; Avail: Defense Technical Information Center (DTIC)

The authors explore the use of a shoe-mounted camera as a sensory system for wearable computing. They demonstrate tools useful for gait analysis, obstacle detection, and context recognition. Using only visual information, they detect periods of stability and motion during walking. In the stable phase, the foot can be assumed to be parallel to the ground plane. In this condition, the floor dominates the lower part of the camera's view, and they show that it can be segmented out from the remainder of the scene, leaving walls and obstacles. They also demonstrate floor surface recognition for context awareness.
DTIC
Cameras; Computer Vision; Digital Cameras; Image Processing; Shoes; Walking

20050195927 Massachusetts Inst. of Tech., Cambridge, MA USA
Regulation and Entrainment in Human-Robot Interaction
Breazeal, Cymthia; Jan. 2000; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-95-1-0600; DABT-63-99-1-0012
Report No.(s): AD-A434689; No Copyright; Avail: Defense Technical Information Center (DTIC)

Newly emerging robotics applications for domestic or entertainment purposes are slowly introducing autonomous robots into society at large. A critical capability of such robots is their ability to interact with humans, and in particular, untrained users. This paper explores the hypothesis that people will intuitively interact with robots in a natural social manner provided the robot can perceive, interpret, and appropriately respond with familiar human social cues. Two experiments are presented in which naive human subjects interact with an anthropomorphic robot. Evidence for mutual regulation and entrainment of the interaction is presented, and how the benefits the interaction as a whole is discussed.
DTIC
Bionics; Entrainment; Robots

20050195928 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA
Figure/Ground Segregation from Human Cues
Arsenio, Artur M.; Jan. 2004; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT-63-00-C-10102
Report No.(s): AD-A434690; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents a new embodied approach for segmentation by a humanoid robot. It relies on interactions with a human teacher that drives the robot through the process of segmenting objects from arbitrarily complex, nonstatic images. By exploiting movements with a strong periodic or discontinuity content, the robot's visual system segments a wide variety of objects from images, with varying conditions of luminosity and a different number of moving artifacts in the scene. The detection is carried out at different time scales for a better compromise between frequency and spatial resolution. The techniques presented ca be used in a passive vision system with a human instructor guiding the segmentation process. But a robot also may guide the process by itself, such as by poking or grabbing. The authors proposed a grouping strategy to segment objects that are not allowed to move and therefore may be difficult to separate from the background. This human-centered technique is especially powerful for segmenting fixed or heavy objects in a scene or to teach a robot segmenting through the use of books. The paper focuses on segmenting objects with similar color or texture as background, multiple moving objects in a scene, and objects in scenes that vary in robustness and luminosity.
DTIC
Computer Vision; Cues; Learning; Robots; Segments; Visual Perception

20050195929 Massachusetts Inst. of Tech., Cambridge, MA USA
Towards Manipulation-Driven Vision
Fitzpatrick, Paul M.; Metta, Giorgio; Jan. 2001; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT-63-00-C-10102
Report No.(s): AD-A434691; No Copyright; Avail: Defense Technical Information Center (DTIC)

For the purposes of manipulation, the authors would like to know what parts of the environment are physically coherent ensembles, that is, which parts will move together, and which parts are more or less independent. It takes a great deal of experience before this judgement can be made from purely visual information. This paper develops active strategies for acquiring that experience through experimental manipulation, using tight correlations between arm motion and optic flow to detect both the art itself and the boundaries of objects with which it comes into contact. The number of papers written on techniques for visual segmentation is vast. Methods for characterizing the shape of an object through tactile information also are being developed, such as shape from probing or pushing. But while it has long been known that motor strategies can aid vision, work on active vision has focused almost exclusively on moving cameras. There is much to be said about bringing a manipulator into the equation, as the authors have shown in this paper. Many variants and extensions to the experimental 'poking' strategy explored here are possible.
DTIC
Artificial Intelligence; Computer Vision; Robots; Segments; Touch; Visual Perception

20050195932 Massachusetts Inst. of Tech., Cambridge, MA USA
Object Lesson: Discovering and Learning to Recognize Objects
Fitzpatrick, Paul; Jan. 2002; 15 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434695; No Copyright; Avail: Defense Technical Information Center (DTIC)

Statistical machine learning has revolutionized computer vision. Systems trained on large quantities of empirical data can achieve levels of robustness that far exceed their hand-crafted competitors. But this robustness is in a sense 'shallow' since a shift in context to a situation not explored in the training data can completely destroy it. This is not an intrinsic feature of the machine learning approach, but rather of the rigid separation of the powerfully adaptive training phase from the final cast-in-stone system. An alternative this work explores is to build 'deep' systems that contain not only the trained-up perceptual modules, but the tools used to train them, and the resources necessary to acquire appropriate training data. Thus, if a situation occurs that was not explored in training, the system can go right ahead and explore it. This is exemplified through an object recognition system that is tightly coupled with an 'active segmentation' behavior that can discover the boundaries of objects by making them move.
DTIC
Exploration; Robots

20050195936 Massachusetts Inst. of Tech., Cambridge, MA USA
Emotive Qualities in Robot Speech
Breazeal, Cynthia; Jan. 2000; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-99-1-0012
Report No.(s): AD-A434701; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper explores the expression of emotion in synthesized speech for an anthropomorphic robot. We have adapted several key emotional correlates of human speech to the robot's speech synthesizer to allow the robot to speak in either an angry, calm, disgusted, fearful, happy, sad, or surprised manner. We have evaluated our approach through acoustic analysis of the speech patterns for each vocal affect and have studied how well human subjects perceive the intended affect.
DTIC
Emotions; Quality; Robots; Speech

20050195937 Massachusetts Inst. of Tech., Cambridge, MA USA
The Whole World in Your Hand: Active and Interactive Segmentation
Arsenio, Artur; Fitzpatrick, Paul; Kemp, Charles C.; Metta, Giorgio; Jan. 2003; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434702; No Copyright; Avail: Defense Technical Information Center (DTIC)

Object segmentation is a fundamental problem in computer vision and a powerful resource for development. This paper presents three embodied approaches to the visual segmentation of objects. Each approach to segmentation is aided by the presence of a hand or arm in the proximity of the object to be segmented. The first approach is suitable for a robotic system, where the robot can use its arm to evoke object motion. The second method operates on a wearable system, viewing the world from a human's perspective, with instrumentation to help detect and segment objects that are held in the wearer's hand. The third method operates when observing a human teacher, locating periodic motion (finger/arm/ object waving or tapping) and using it as a seed for segmentation. We show that object segmentation can serve as a key resource for development by demonstrating methods that exploit high-quality object segmentations to develop both low-level vision capabilities (specialized feature detectors) and high-level vision capabilities (object recognition and localization).
DTIC
Computers; Robots; Segments

20050195938 Massachusetts Inst. of Tech., Cambridge, MA USA
Active Vision for Sociable Robots
Breazeal, Cynthia; Edsinger, Aaron; Fitzpatrick, Paul; Scassellati, Brian; Jan. 2001; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-99-1-0012
Report No.(s): AD-A434703; No Copyright; Avail: Defense Technical Information Center (DTIC)

In 1991, Ballard described the implications of having a visual system that could actively position the camera coordinates in response to physical stimuli. In humanoid robotic systems, or in any animate vision system that interacts with people, social dynamics provide additional levels of constraint and provide additional opportunities for processing economy. In this paper, we describe an integrated visual-motor system that has been implemented on a humanoid robot to negotiate the robot's physical constraints, the perceptual needs of the robot's behavioral and motivational systems, and the social implications of motor acts.
DTIC
Computer Vision; Robots; Visual Perception

20050195939 Massachusetts Inst. of Tech., Cambridge, MA USA
Foundations for a Theory of Mind for a Humanoid Robot
Scassellati, Brian M.; May 2001; 174 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-99-1-0012; N00014-95-1-0600
Report No.(s): AD-A434704; No Copyright; Avail: Defense Technical Information Center (DTIC)
Human social dynamics rely upon the ability to correctly attribute beliefs, goals, and percepts to other people. The set of abilities that allow an individual to infer these hidden mental states based on observed actions and behavior has been called a 'theory of mind'. Existing models of theory of mind have sought to identify a developmental progression of social skills that serve as the basis for more complex cognitive abilities. These skills include detecting eye contact, identifying self-propelled stimuli, and attributing intent to moving objects. If we are to build machines that interact naturally with people, our machines must both interpret the behavior of others according to these social rules and display the social cues that will allow people to naturally interpret the machine's behavior. Drawing from the models of Baron-Cohen (1995) and Leslie (1994), a novel architecture called embodied theory of mind was developed to link high-level cognitive skills to the low-level perceptual abilities of a humanoid robot. The implemented system determines visual saliency based on inherent object attributes, high-level task constraints, and the attentional states of others. Objects of interest are tracked in real-time to produce motion trajectories which are analyzed by a set of naive physical laws designed to discriminate animate from inanimate movement. Animate objects can be the source of attentional states (detected by finding faces and head orientation) as well as intentional states (determined by motion trajectories between objects). Individual components are evaluated by comparisons to human performance on similar tasks, and the complete system is evaluated in the context of a basic social learning mechanism that allows the robot to mimic observed movements.
DTIC
Cognition; Robots; Visual Perception

20050195941 Massachusetts Inst. of Tech., Cambridge, MA USA
Behavior-Based Early Language Development on a Humanoid Robot
Varshavskaya, Paulina; Jan. 2002; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434707; No Copyright; Avail: Defense Technical Information Center (DTIC)
We are exploring the idea that early language acquisition could be better modelled on an artificial creature by considering the pragmatic aspect of natural language and of its development in human infants. We have implemented a system of vocal behaviors on Kismet in which 'words' or concepts are behaviors in a competitive hierarchy. This paper reports on the framework, the vocal system's architecture and algorithms, and some preliminary results from vocal label learning and concept formation.
DTIC
Natural Language (Computers); Robots

20050195946 Massachusetts Inst. of Tech., Cambridge, MA USA
Discriminating Animate from Inanimate Visual Stimuli
Scassellati, Brian; Jan. 2000; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-99-1-0012
Report No.(s): AD-A434714; No Copyright; Avail: Defense Technical Information Center (DTIC)
From as early as 6 months of age, human children distinguish between motion patterns generated by animate objects from patterns generated by moving inanimate objects, even when the only stimulus that the child observes is a single point of light moving against a blank background. The mechanisms by which the animate/inanimate distinction are made are unknown, but

have been shown to rely only upon the spatial and temporal properties of the movement. In this paper, I present both a multi-agent architecture that performs this classification as well as detailed comparisons of the individual agent contributions against human baselines.
DTIC
Discrimination; Motion; Pattern Recognition; Robots; Visual Stimuli

20050195948 Massachusetts Inst. of Tech., Cambridge, MA USA
How to Build Robots that Make Friends and Influence People
Breazeal, Cynthia L.; Scassellati, Brian; Jan. 2000; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-95-1-0600; DABT-63-99-1-0012
Report No.(s): AD-A434716; No Copyright; Avail: Defense Technical Information Center (DTIC)
To interact socially with a human a robot must convey intentionality, that is, the human must believe that the robot has beliefs, desires, and intentions. The authors have constructed a robot, named 'Kismet,' that exploits natural human social tendencies to convey intentionality through motor actions and facial expressions. They present results on the integration of perception, attention, motivation, behavior, and motor systems that allow the robot to engage in infant-like interactions with a human caregiver.
DTIC
Human Relations; Robots

20050195950 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA
Feel the Beat: Using Cross-Modal Rhythm to Integrate Perception of Objects, Others, and Self
Fitzpatrick, Paul; Arsenio, Artur; Jan. 2003; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434719; No Copyright; Avail: Defense Technical Information Center (DTIC)
For a robot go to be capable of development, it must be able to explore its environment and learn from its experiences. It must find (or create) opportunities to experience the unfamiliar in ways that reveal properties valid beyond the immediate context. In this paper, we develop a novel method for using the rhythm of everyday actions as a basis for identifying the characteristic appearance and sounds associated with objects, people, and the robot itself. Our approach is to identify and segment groups of signals in individual modalities (sight, hearing, and proprioception) based on their rhythmic variations, then to identify and bind causally-related groups of signals across different modalities. By including proprioception as a modality, this cross-modal binding method applies to the robot itself, and we report a series of experiments in which the robot learns about the characteristics of its own body.
DTIC
Proprioception; Robots

20050195953 Massachusetts Inst. of Tech., Cambridge, MA USA
Robot Arm Control Exploiting Natural Dynamics
Williamson, Matthew M.; Jun. 1999; 94 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-83-K-0125; N00014-84-K-0099
Report No.(s): AD-A434727; No Copyright; Avail: Defense Technical Information Center (DTIC)
This thesis presents an approach to robot arm control exploiting natural dynamics. The approach consists of using a compliant arm whose joints are controlled with simple non-linear oscillators. The arm has special actuators which makes it robust to collisions and gives it a smooth compliant motion. The oscillators produce rhythmic commands of the joints of the arm, and feedback of the joint motions is used to modify the oscillator behavior. The oscillators enable the resonant properties of the arm to be exploited to perform a variety of rhythmic and discrete tasks. These tasks include tuning into the resonant frequencies of the arm itself, juggling, turning cranks, playing with a Slinky toy, sawing wood, throwing balls, hammering nails and drumming. For most of these tasks, the controllers at each joint are completely independent, being coupled by mechanical coupling through the physical arm of the robot. The thesis shows that this mechanical coupling allows the oscillators to automatically adjust their commands to be appropriate for the arm dynamics and the task. This coordination is robust to large changes in the oscillator parameters, and large changes in the dynamic properties of the arm.
DTIC
Motion; Psychomotor Performance; Robot Arms; Robots

20050195954 Massachusetts Inst. of Tech., Cambridge, MA USA
Better Vision Through Manipulation
Metta, Giorgio; Fitzpatrick, Paul; Jan. 2002; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434728; No Copyright; Avail: Defense Technical Information Center (DTIC)

For the purposes of manipulation, we would like to know what parts of the environment are physically coherent ensembles -- that is, which parts will move together, and which are more or less independent. It takes a great deal of experience before this judgement can be made from purely visual information. This paper develops active strategies for acquiring that experience through experimental manipulation, using tight correlations between arm motion and optic flow to detect both the arm itself and the boundaries of objects with which it comes into contact. We argue that following causal chains of events out from the robot's body into the environment allows for a very natural developmental progression of visual competence, and relate this idea to results in neuroscience.
DTIC
Manipulators; Motion; Robots; Visual Perception

20050195955 Massachusetts Inst. of Tech., Cambridge, MA USA
An Attentional System for a Humanoid Robot Exploiting Space Variant Vision
Metta, Giorgio; Jan. 2001; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434729; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper describes an implementation of an attentional system for a humanoid robot based completely on space variant vision (in particular log-polar). The aim is that of providing the robot with a suitable measure of position, speed and saliency of possibly interesting objects for saccading and tracking. The major advantage of log-polar based imaging is related to the reduced number of pixel while maintaining a large field of view. This arrangement is very well suited for motor control, where the high-resolution center (fovea) alows precise positioning and, at the same time, the coarse resolution periphery permits detection of potential targets. Algorithms for color processing, optic flow, and disparity computation were developed within this architecture. The attentional modules are intended as the first layer of a more complicated system, which shall include learning of object recognition, trajectory tracking, and naive physics understanding during the natural interacion of the robot with the environment.
DTIC
Computer Vision; Image Processing; Imaging Techniques; Pixels; Robots; Vision

20050195956 Massachusetts Inst. of Tech., Cambridge, MA USA
Duo: A Human/Wearable Hybrid for Learning About Common Manipulate Objects
Kemp, Charles C.; Jan. 2002; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434730; No Copyright; Avail: Defense Technical Information Center (DTIC)

Humanoid robots would benefit from a better understanding of common manipulable objects and the human behaviors associated with them. Duo is a human/wearable hybrid that is designed to learn about this important domain of human intelligence by interacting with natural manipulable objects in unconstrained environments. Duo's wearable AI system measures the kinematic configuration of the human's head, torso and dominate arm, while watching the workspace of the human's hand through a head-mounted camera. Duo also requests helpful actions from the human through speech via headphones. This paper presents results on an initial set of behaviors for Duo which lead to high-quality segmentations of common manipulable objects in unconstrained human environments. In Duo, the wearable AI system essentially subsumes the abilities of its cooperative human partner by sharing the human's sensor input and directing a portion of the human's actions. Together, the cooperative human and the wearable AI system can be thought of as constituting a new kind of humanoid robot that complements more traditional, wholly synthetic humanoid robots by allowing researchers to circumvent some of the currently unsolved problems in the field, from dextrous object manipulation to unrestricted mobility.
DTIC
Artificial Intelligence; Manipulators; Robots

20050195961 Massachusetts Inst. of Tech., Cambridge, MA USA
Sociable Machines: Expressive Social Exchange between Humans and Robots
Breazeal, Cynthia L.; May 2000; 306 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-95-1-0600; DABT-63-99-1-0012
Report No.(s): AD-A434739; No Copyright; Avail: Defense Technical Information Center (DTIC)

Sociable humanoid robots are natural and intuitive for people to communicate with and to teach. The author presents recent advances in building an autonomous humanoid robot, named 'Kismet,' that can engage humans in expressive social interaction. She outlines a set of design issues and a framework that she has found to be of particular importance for sociable robots. Having a human-in-the-loop places significant social constraints on how the robot aesthetically appears, how its sensors are configured, its quality of movement, and its behavior. Inspired by infant social development, psychology, ethology, and evolutionary perspectives, this work integrates theories and concepts from these diverse viewpoints to enable Kismet to enter into natural and intuitive social interaction with a human caregiver, reminiscent of parent-infant exchanges. Kismet perceives a variety of natural social cues from visual and auditory channels, and delivers social signals to people through gaze direction, facial expressions, body posture, and vocalizations. The author presents the implementation of Kismet's social competencies and evaluates each with respect to the following: (1) the ability of naive subjects to read and interpret the robot's social cues; (2) the robot's ability to perceive and appropriately respond to naturally offered social cues; (3) the robot's ability to elicit interaction scenarios that afford rich learning potential; and (4) how this produces a rich, flexible, dynamic interaction that is physical, affective, and social. Numerous studies with naive human subjects are described that provide the data upon which the author bases her evaluations.
DTIC
Human Relations; Robots

20050195968 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA
On Stability and Tuning of Neural Oscillators: Application to Rhythmic Control of a Humanoid Robot
Arsenio, Artur M.; Jan. 2004; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT-63-00-C-10102
Report No.(s): AD-A434751; No Copyright; Avail: Defense Technical Information Center (DTIC)

Neural oscillators offer a natural tool for exploiting and adapting to the dynamics of the controlled system. The capability of entraining the frequency of the input signal or resonance modes of dynamical systems have been increasingly used in robotics' mechanisms to accomplish complex tasks. However, the application of Matsuoka neural oscillators as controllers requires knowledge of the range of values for the parameters for which the system oscillates, and the warranty of stability. Thus, this paper studies in-depth the stability and tuning of Matsuoka neural oscillators, and presents a careful analysis of its behavior on the time-domain. The method is applied on a humanoid robot for playing musical instruments.
DTIC
Control; Neural Nets; Oscillators; Robotics; Robots; Stability; Tuning

20050195969 Massachusetts Inst. of Tech., Cambridge, MA USA
Perception and Perspective in Robotics
Fitzpatrick, Paul; Jan. 2003; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT-63-00-C-10102
Report No.(s): AD-A434752; No Copyright; Avail: Defense Technical Information Center (DTIC)

To a robot, the world is a sea of ambiguity, in which it will sink or swim depending on the robustness of its perceptual abilities. But robust machine perception has proven difficult to achieve. This paper argues that robots must be given not just particular perceptual competencies, but the tools to forge those competencies out of raw physical experiences. Three important tools for extending a robot's perceptual abilities whose importance has been recognized individually are related and brought together. The first is active perception, in which the robot employs motor action to reliably perceive properties of the world that it otherwise could not. The second is development, in which experience is used to improve perception. The third is interpersonal influences, in which the robot's percepts are guided by those of an external agent. Examples are given for object segmentation, object recognition, and orientation sensitivity; initial work on action understanding also is described. This work is implemented on two robots, 'Cog' and 'Kismet.' Cog is an upper torso humanoid that has previously been applied to tasks such as visually guided pointing and rhythmic operations like turning a crank or driving a slinky. Kismet is an infant-like robot whose form and behavior are designed to elicit nurturing responses from humans. It is essentially an active vision head

augmented with expressive facial features so that it can both send and receive human-like social cues.
DTIC
Computer Vision; Learning; Robotics; Robots; Visual Perception

20050195970 Massachusetts Inst. of Tech., Cambridge, MA USA
Teaching an Old Robot New Tricks: Learning Novel Tasks via Interaction with People and Things
Marjanovic, Matthew J.; Jun. 2003; 181 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434753; AI-TR-2003-013; No Copyright; Avail: Defense Technical Information Center (DTIC)

As AI has begun to reach out beyond its symbolic, objectivist roots into the embodied, experientialist realm, many projects are exploring different aspects of creating machines which interact with and respond to the world as humans do. Techniques for visual processing, object recognition, emotional response, gesture production and recognition, etc., are necessary components of a complete humanoid robot. However, most projects invariably concentrate on developing a few of these individual components, neglecting the issue of how all of these pieces would eventually fit together. The focus of the work in this dissertation is on creating a framework into which such specific competencies can be embedded, in a way that they can interact with each other and build layers of new functionality. To be of any practical value, such a framework must satisfy the real-world constraints of functioning in real-time with noisy sensors and actuators. The humanoid robot Cog provides an unapologetically adequate platform from which to take on such a challenge. This work makes three contributions to embodied AI. First, it offers a general-purpose architecture for developing behavior based systems distributed over networks of PC's. Second, it provides a motor-control system that simulates several biological features which impact the development of motor behavior. Third it develops a framework for a system which enables a robot to learn new behaviors via interacting with itself and the outside world.
DTIC
Computer Networks; Education; Intelligence; Learning; Machine Learning; Psychomotor Performance; Robots; Tasks; Visual Perception

20050195971 Massachusetts Inst. of Tech., Cambridge, MA USA
Theory of Mind for a Humanoid Robot
Scassellati, Brian; Jan. 2000; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434754; No Copyright; Avail: Defense Technical Information Center (DTIC)

If we are to build human-like robots that can interact naturally with people, our robots must know not only about the properties of objects but also the properties of animate agents in the world. One of the fundamental social skills for humans is the attribution of beliefs, goals, and desires to other people. This set of skills has often been called a 'theory of mind.' This paper presents the theories of Leslie and Baron-Cohen on the development of theory of mind in human children and discusses the potential application of both of these theories to building robots with similar capabilities. Initial implementation details and basic skills (such as finding faces and eyes and distinguishing animate from inanimate stimuli) are introduced. I further speculate on the usefulness of a robotic implementation in evaluating and comparing these two models.
DTIC
Cognition; Robots; Visual Perception

20050195973 Massachusetts Inst. of Tech., Cambridge, MA USA
Grounding Vision through Experimental Manipulation
Fitzpatrick, Paul; Metta, Giorgio; Jan. 2002; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434758; No Copyright; Avail: Defense Technical Information Center (DTIC)

Experimentation is crucial to human progress at all scales, from society as a whole to a young infant in its cradle/ It allows us to elicit learning episodes suited to our own needs and limitations. This paper develops active strategies for a robot to acquire visual experience through simple experimental manipulation. The experiments are oriented towards determining what parts of the environment are physically coherent- that is, which parts will move together, and which are more or less independent. We argue that following causal chains of events out from the robot's body into the environment allows for a very natural developmental progression of visual competence, and relate this idea to results in neuroscience.
DTIC
Electrical Grounding; Robots; Visual Perception

20050195974 Baker (Wilfred) Engineering, Inc., San Antonio, TX USA
Children, Humanoid Robots and Caregivers
Arsenio, Artur; Jan. 2004; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434761; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents developmental learning on a humanoid robot from human-robot interactions. We consider in particular teaching humanoids as children during the child's Separation and Individuation developmental phase (Mahler, 1979). Cognitive development during this phase is characterized both by the child's dependence on her mother for learning while becoming awareness of her own individuality, and by self-exploration of her physical surroundings. We propose a learning framework for a humanoid robot inspired on such cognitive development.
DTIC
Children; Learning; Robots

20050195975 Massachusetts Inst. of Tech., Cambridge, MA USA
Map Building from Human-Computer Interactions
Jan. 2004; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434764; No Copyright; Avail: Defense Technical Information Center (DTIC)

On-line help from a human actor will be exploited to facilitate computer perception. This paper proposes and innovative real-time algorithm - running on an active vision head - to build 3D scene descriptions from human cues. The theory is supported by experimental results both for figure/ground segregation of typical heavy objects in a scene (such as furniture), and for 3D object/scene reconstruction.
DTIC
Computer Vision; Human-Computer Interface; Robots; Visual Perception

20050195979 Massachusetts Inst. of Tech., Cambridge, MA USA
Humanoid Robots: A New Kind of Tool
Adams, Bryan; Breazeal, Cynthia L.; Brooks, Rodney; Scassellati, Brian; Jan. 2000; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434770; No Copyright; Avail: Defense Technical Information Center (DTIC)

In 1993, the authors began a humanoid robotics project at the MIT artificial Intelligence Laboratory aimed at constructing a robot for use in exploring theories of human intelligence. In this article, the authors describe three aspects of their research methodology that distinguish their work from other humanoid projects. First, their humanoid robots are designed to act autonomously and safely in natural workspaces with people. Second, their robots are designed to interact socially with people by exploiting natural human social cues. Third, they believe that robotics offers a unique tool for testing models of human intelligence drawn from developmental psychology and cognitive science.
DTIC
Bionics; Human Relations; Robots

20050195980 Massachusetts Inst. of Tech., Cambridge, MA USA
Open Object Recognition for Humanoid Robots
Fitzpatrick, Paul; Jan. 2003; 2 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434771; No Copyright; Avail: Defense Technical Information Center (DTIC)

Robots must be able to adapt gracefully to frequent and dramatic changes in their workspace if they are to operate successfully in human-centered environments, as opposed to controlled industrial settings. At the MIT Humanoid Robotics Group, investigators are developing methods that permit their robots to deduce the structure of novel activities, adopt the vocabulary appropriate for communication about the task at hand, and learn about the appearance and behavior of unfamiliar objects. The latter ability is discussed in this paper. The humanoid robot, 'Cog,' uses active exploration to resolve visual ambiguity in its workspace. As Cog accumulates experience, it clusters episodes of object interaction to learn the appearance and properties of novel, unfamiliar objects. This process is called 'open object recognition.' An operator can then introduce names for objects to facilitate further task-related communication.
DTIC
Computer Vision; Learning; Pattern Recognition; Robots; Segments; Target Recognition; Visual Perception

20050195985 Massachusetts Inst. of Tech., Cambridge, MA USA

Learning about Objects through Action - Initial Steps towards Artificial Cognition

Fitzpatrick, Paul M.; Metta, Giorgio; Natale, Lorenzo; Rao, Sajit; Sandini, Giulio; Jan. 2001; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DABT63-00-C-10102

Report No.(s): AD-A434778; No Copyright; Avail: Defense Technical Information Center (DTIC)

Within the field of Neuro Robotics we are driven primarily by the desire to understand how humans and animals live and grow and solve everyday problems. To this aim we adopted a 'learn by doing' approach by building artificial systems, e.g. robots, that not only look like human beings but also represent a model of some brain process. They should, ideally, behave and interact like human beings (being situated). The main emphasis in robotics has been on systems that act as a reaction to an external stimulus (e.g. tracking, reaching), rather than as a result of an internal drive to explore or 'understand' the environment. We think it is now appropriate to try to move from acting, in the sense explained above, to 'understanding.' As a starting point we addressed the problem of learning about the effects and consequences of self-generated actions. How does the robot learn how to pull an object toward itself or to push it away? How does the robot learn that spherical objects roll while a cube only slides if pushed? Interacting with objects is important because it implicitly explores object representation, even understanding, and can provide definition of objecthood that could not be grasped with a mere passive observation of the world. Further, learning to understand what one's own body can do is an essential step toward learning by imitation. In this view two actions are similar not only if their kinematics and dynamics are similar but rather if the effects on the external world are the same.

DTIC

Artificial Intelligence; Cognition; Learning; Robots

20050195986 Massachusetts Inst. of Tech., Cambridge, MA USA

From First Contact to Close Encounters: A Developmentally Deep Perceptual System for a Humanoid Robot

Fitzpatrick, Paul M.; Jun. 2003; 152 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434779; No Copyright; Avail: CASI; A08, Hardcopy

This thesis presents a perceptual system for a humanoid robot that integrates abilities such as object localization and recognition with the deeper developmental machinery required to forge those competences out of raw physical experiences. It shows that a robotic platform can build up and maintain a system for object localization, segmentation, and recognition, starting from very little. What the robot starts with is a direct solution to achieving figure/ ground separation: it simply 'pokes around' in a region of visual ambiguity and watches what happens. If the arm passes through an area, that area is recognized as free space. If the arm collides with an object, causing it to move, the robot can use that motion to segment the object from the background. Once the robot can acquire reliable segmented views of objects, it learns from them, and from then on recognizes and segments those objects without further contact. Both low-level and high-level visual features can also be learned in this way, and examples are presented for both: orientation detection and affordance recognition, respectively.

DTIC

Detection; Pattern Recognition; Robots

20050196015 Massachusetts Inst. of Tech., Cambridge, MA USA

Role Transfer for Robot Tasking

Fitzpatrick, Paul; Apr. 2002; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434821; No Copyright; Avail: Defense Technical Information Center (DTIC)

Robotics has proven most successful in narrowly defined domains that offer sufficient constraints to make automated perception and action tractable. The goal of this thesis is to take a step towards generality by developing methods for applying a robot to many different narrow domains. This is complementary to the more common research goal of enhancing machine perception and action to deal with wider domains. This approach to extending the range of application of a technology through parameterization rather than generalization is key to fields such as automatic speech recognition. It has the theoretical advantage of providing a framework for factoring context into perception, and the practical advantage of creating systems that do useful work with limited technology. I propose a scheme for communicating constraints to a mechanically general-purpose robot, so that it can perform novel tasks without needing to first solve open problems in perception and action. In particular, this thesis develops mechanisms for communicating the structure of simple tasks to a robot, translating this structure into a set of supervised learning problems for parts of the task which are difficult to communicate directly, and solving those problems with the guidance of a protocol for inducing feature selection.

DTIC

Machine Learning; Robots

20050196017 Massachusetts Inst. of Tech., Cambridge, MA USA
Social Constraints on Animate Vision
Breazeal, Cynthia; Edsinger, Aaron; Fitzpatrick, Paul; Scassellati, Brian; Jan. 2000; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434823; No Copyright; Avail: Defense Technical Information Center (DTIC)

In 1991, Ballard described the implications of having a visual system that could actively position the camera coordinates in response to physical stimuli. In humanoid robotic systems, or in any animate vision system that interacts with people, social dynamics provide additional levels of constraint and provide additional opportunities for processing economy. In this paper, we describe an integrated visual-motor system that has been implemented on a humanoid robot to negotiate the robot's physical constraints, the perceptual needs of the robot's behavioral and motivational systems, and the social implications of motor acts.
DTIC
Robots; Vision

20050196018 Massachusetts Inst. of Tech., Cambridge, MA USA
A Context-Dependent Attention System for a Social Robot
Jan. 1998; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434824; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents part of an ongoing project to integrate perception, attention, drives, emotions, behavior arbitration, and expressive acts for a robot designed to interact socially with humans. The authors present the design of a visual attention system based on a model of human visual search behavior from Wolfe (1994). The attention system integrates perceptions (e.g., motion detection, color saliency, and face pop-outs) with habituation effects and influences from the robot's motivational and behavioral state to create a context-dependent attention activation map. This activation map is used to direct eye movements and to satiate the drives of the motivational system.
DTIC
Computer Vision; Context; Robots; Visual Perception

20050196022 Massachusetts Inst. of Tech., Cambridge, MA USA
Cognitive-Developmental Learning for a Humanoid Robot: A Caregiver's Gift
Arsenio, Artur M.; May 2004; 315 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434828; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goal of this work is to build a cognitive system for the humanoid robot, Cog, that exploits human caregivers as catalysts to perceive and learn about actions, objects, scenes, people, and the robot itself. This thesis addresses a broad spectrum of machine learning problems across several categorization levels. Actions by embodied agents are used to automatically generate training data for the learning mechanisms, so that the robot develops categorization autonomously. Taking inspiration from the human brain, a framework of algorithms and methodologies was implemented to emulate different cognitive capabilities on the humanoid robot Cog. This framework is effectively applied to a collection of AI, computer vision, and signal processing problems. Cognitive capabilities of the humanoid robot are developmentally created, starting from infant-like abilities for detecting, segmenting, and recognizing percepts over multiple sensing modalities. Human caregivers provide a helping hand for communicating such information to the robot. This is done by actions that create meaningful events (by changing the world in which the robot is situated) thus inducing the 'compliant perception' of objects from these human-robot interactions. Self-exploration of the world extends the robot's knowledge concerning object properties. This thesis argues for enculturating humanoid robots using infant development as a metaphor for building a humanoid robot's cognitive abilities. A human caregiver redesigns a humanoid's brain by teaching the humanoid robot as she would teach a child, using children's learning aids such as books, drawing boards, or other cognitive artifacts. Multi-modal object properties are learned using these tools and inserted into several recognition schemes, which are then applied to developmentally acquire new object representations. The humanoid robot therefore sees the world through the caregiver's eyes.
DTIC
Machine Learning; Robots; Theses

20050196051 Georgia Inst. of Tech., Atlanta, GA USA

Real-time Cooperative Behavior for Tactical Mobile Robot Teams: Skills Impact Study for Tactical Mobile Robot Operational Units

Nov. 2000; 93 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAE07-98-C-L038

Report No.(s): AD-A434877; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report provides a detailed study of the design of feasible human-robot interfaces for near-term deployment in a robot unit, defined as a tightly coupled group of humans using a multiplicity of robots as tactical tools. There is a strong relationship between three phases of fielding man-machine systems of this type: system design, operator selection, and operator training. Here we consider all of these dimensions, developing an understanding of the tradeoffs between highly-trained operators versus novice operators, the importance of specific cognitive and intellectual reasoning abilities of potential operators, and the impact of system design on all of this. Clearly, a sophisticated, well-designed system will require less training and enable a larger set of people to interact with it. The purpose of this study is to span this space of potential design and human factors issues and identify the inherent wins, losses, and trade-offs given the goal of rapidly fielding such a system.

DTIC

Man Machine Systems; Real Time Operation; Robots

20050196052 Georgia Inst. of Tech., Atlanta, GA USA

Real-time Cooperative Behavior for Tactical Mobile Robot Teams: Subsystems Specification/A002

Oct. 1998; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAE07-98-C-L038

Report No.(s): AD-A434878; No Copyright; Avail: Defense Technical Information Center (DTIC)

This document constitutes the subsystem specifications and is submitted to TACOM as deliverable A002. It contains a description of the overall system architecture to be used within Georgia Tech's research for the DARPA Tactical Mobile Robotics Program. It further provides functional specifications for each of the major system components. More specific details regarding interfaces will be provided in future interface control documents to be submitted according to the prescribed deliverables schedule of the contract. The overall system architecture being developed for this effort contains 3 major subsystems: Executive, Premission, and Runtime. The executive subsystem is the major focus for operator interaction. It provides an interface to both the runtime simulators and actual robot controllers, as well as the premission specification facilities and the physical operator groundstation itself. The premission subsystem's role is to provide an easy-to-use interface for designing robot missions and a means for evaluating overall usability. The runtime control system, which is located on each active robot, provides the execution framework for enacting reactive behaviors, acquiring sensor data and reporting back to the executive subsystem to provide situational awareness to the team commander. Additionally, a separate support system is provided for interprocess communications. Section two of this document provides the functional specifications for each of these subsystems and their underlying components.

DTIC

Architecture (Computers); Real Time Operation; Robots

20050196053 Georgia Inst. of Tech., Atlanta, GA USA

Real-time Cooperative Behavior for Tactical Mobile Robot Teams

Feb. 2001; 211 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAE07-98-C-L038

Report No.(s): AD-A434879; No Copyright; Avail: Defense Technical Information Center (DTIC)

Our technical approach to achieving intelligent tactical behaviors for TMR robots is described in this section. We have specific technical approaches in three research areas: Fault-tolerant multi-robot behaviors, Mission specification and user interface, and Real time resource management. (Originally, communication minimization was also a research topic, but was deleted early in the program at government request.) We envision that the nature of military operations in urban terrain (MOUT) can fundamentally change by empowering the personnel in these units with multiple mobile robot assets that extend their ability to perceive and act within the battlefield without increasing their exposure. It is insufficient merely to deploy these assets; they must be controlled and configured in a meaningful way by average soldiers. This is no mean feat, but if this vision is realized it can provide significant force multiplication capabilities and extended reach within the battlespace (force projection). This must be accompanied by feedback and control methods that do not overload the operator of the system and yet can provide uniform control of multiple advanced robotic systems while simultaneously increasing the unit's overall situational awareness. The impact of this system will be manifested in several ways: Reactive behavioral configurations for

robot teams that support fault-tolerant operations typically found in the battlefield, to increase immunity against electronic countermeasures and individual agent failure. Team tele-autonomy providing command and control capabilities for entire groups or subgroups of battlefield robots without producing cognitive overload on the operator. The ability of a military operator to expand his influence in the battlespace, dynamically controlling in real-time his deployed robotic team assets in a context-sensitive manner.
DTIC
Human Factors Engineering; Human-Computer Interface; Real Time Operation; Robots

20050196079 Wyoming Univ., Laramie, WY USA
Optimizing Interaction Potentials for Multi-Agent Surveillance
Spears, William; Spears, Diana; Kerr, Wesley; Hettiarachchi, Suranga; Zarzhitsky, Dimitri; Jan. 2004; 104 pp.; In English
Contract(s)/Grant(s): W911NF-04-1-0167
Report No.(s): AD-A434929; UW-CS-AP-WMS-ARO-1; ARO-47061.1-MA-DRP; No Copyright; Avail: Defense Technical Information Center (DTIC)

We have developed a physics-based control framework that provides a practical yet principled approach for designing collective systems. This framework is called 'artificial physics' (AP), because agents perform actions based on virtual forces exerted on them by other agents and the environment. These forces are designed to ensure that the global behavior of a multi-agent system arises from local interactions of the agents, as well as from task-specific goals and constraints. We extend AP by using genetic algorithms (GAs) to search a space of interaction potentials so that the desired behavior emerges from the interactions between the agents. This extended framework is applied to the task of surveillance, where a team of unmanned air vehicles (UAVs) must provide maximum sensory coverage of terrain, in order to maximize the probability of detection of targets of interest. This report summarizes preliminary results that indicate that robust behavior is achieved, despite loss of assets or sensor degradation. This report also provides some initial theoretical analyses of simple behavior-based asset controllers on the surveillance task.
DTIC
Artificial Intelligence; Surveillance

20050196088 Naval Research Lab., Washington, DC USA
Building a Multimodal Human-Robot Interface
Perzanowski, Dennis; Schultz, Alan C.; Adams, William; Marsh, Elaine; Bugajska, Magda; Jan. 2001; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434941; No Copyright; Avail: Defense Technical Information Center (DTIC)

No one claims that people must interact with machines in the same way that they interact with other humans. Certainly, people do not carry on conversations with their toasters in the morning, unless they have a serious problem. However, the situation becomes a bit more complex when we begin to build and interact with machines or robots that either look like humans or have functionalities and capabilities. Then, people well might interact with their humanlike machines in ways that mimic human-human communication. For example, if a robot has a face, a human might interact with it similarly to how humans interact with other creatures with faces. Specifically, a human might talk to it, gesture to it, smile at it, and so on. If a human interacts with a computer or a machine that understands spoken commands, the human might converse with the machine, expecting it to have competence in spoken language. In our research on a multimodal interface to mobile robots, we have assumed a model of communication and interaction that, in a sense, mimics how people communicate. Our interface therefore incorporates both natural language understanding and gesture recognition as communication modes. We limited the interface to these two models to simplify integrating them in the interface and to make our research more tractable. We believe that with an integrated system, the user is less concerned with how to communicate (which interactive mode to employ for a task) and is therefore free to concentrate on the tasks and goals at hand. Because we integrate all our system's components, users can choose any combination of our interface's modalities. The onus is on our interface to integrate the input, process it, and produce the desired results.
DTIC
Robots; Voice Communication

20050196090 Carnegie-Mellon Univ., Pittsburgh, PA USA
GRACE: An Autonomous Robot for the AAAI Robot Challenge
Simmons, Reid; Goldberg, Dani; Goode, Adam; Montemerlo, Michael; Roy, Nicholas; Schultz, Alan C.; Abramson, Myriam; Horswill, Ian; Kortenkamp, David; Maxwell, Bruce; Jan. 2003; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434943; No Copyright; Avail: Defense Technical Information Center (DTIC)

The AAAI Robot Challenge was established four years ago as a 'grand challenge' for mobile robots. The main objectives of the Challenge are to (a) provide a task that will demonstrate a high level of intelligence and autonomy for robots acting in a natural, peopled, dynamic environment; (b) stimulate state-of-the-art robotics research to address this task; and (c) use robot demonstrations to educate the public about the exciting and difficult challenges of robotics research. When the Challenge was designed, it was anticipated that no single research institution would have adequate resources to meet the Challenge on its own. The Challenge task is to find the registration booth and register at the National Conference on Artificial Intelligence, interact with other attendees, and give a technical talk on itself in an assigned room, and at an assigned time. Ideally, the robot should be given no more information than any other participant arriving in a new city to attend a major technical conference. In particular, that means that the robot should not know the layout of the convention center beforehand, and the environment should not be modified. Practically, however, the organizers understand that compromises and flexibility will be necessary in order to get current state-of-the-art robots to achieve such a task.
DTIC
Autonomy; Robots

20050196096 Naval Research Lab., Washington, DC USA
Two Ingredients for My Dinner with R2D2: Integration and Adjustable Autonomy
Perzanowski, Dennis; Schultz, Alan C.; Marsh, Elain; Adams, William; Jan. 2000; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434949; XB-NRL/MR/5510; No Copyright; Avail: Defense Technical Information Center (DTIC)

While the tone of this paper is informal and tongue-in-cheek, we believe we raise two important issues in robotics and multi-modal interface research; namely, how crucial integration of multiple modes of communication are for adjustable autonomy, which in turn is crucial for having dinner with R2D2. Furthermore, we discuss how our multimodal interface to autonomous robots addresses these issues by tracking goals, allowing for both natural and mechanical modes of input, and how our robotic system adjusts itself to ensure that goals are achieved, despite interruptions.
DTIC
Adjusting; Autonomy; Robots

20050196105 Naval Research Lab., Washington, DC USA
Communicating with Teams of Cooperative Robots
Perzanowski, D.; Schultz, A. C.; Adams, W.; Bugajska, M.; Marsh, E.; Trafton, G.; Brock, D.; Skubic, M.; Abramson, M.; Jan. 2002; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434962; No Copyright; Avail: Defense Technical Information Center (DTIC)

The authors are designing and implementing a multi-modal interface to a team of dynamically autonomous robots. For this interface, they have elected to use natural language and gesture. Gestures can be either natural gestures perceived by a vision system installed on the robot, or they can be made by using a stylus on a Personal Digital Assistant. In this paper,they describe the integrated modes of input and one of the theoretical constructs that they use to facilitate cooperation and collaboration among members of a team of robots. An integrated context and dialog processing component that incorporates knowledge of spatial relations enables cooperative activity between the multiple agents, both human and robotic.
DTIC
Communicating; Human-Computer Interface; Robots; Voice Communication

20050196106 Naval Research Lab., Washington, DC USA
Finding the FOO: A Pilot Study for a Multimodal Interface
Perzanowski, Dennis; Brock, Derek; Adams, William; Bugajska, Magdalena; Schultz, Alan C.; Trafton, J. G.; Blisard, Sam; Skubic, Majorie; Jan. 2003; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434963; No Copyright; Avail: Defense Technical Information Center (DTIC)

In their research on intuitive means for humans and intelligent, mobile robots to collaborate, the authors use a multimodal interface that supports speech and gestural inputs. As a preliminary step to evaluate their approach and to identify practical areas for future work, they conducted a Wizard-of-Oz pilot study with five participants who each collaborated with a robot on a search task in a separate room. The goal was to find a sign in the robot's environment with the word 'FOO' printed on it. Using a subset of their multimodal interface, participants were told to direct the collaboration. As their subordinate, the robot would understand their utterances and gestures, and recognize objects and structures in the search space. Participants conversed with the robot through a wireless microphone and headphone and, for gestural input, used a touch screen displaying

alternative views of the robot's environment to indicate locations and objects.
DTIC
Human-Computer Interface; Remote Control; Robots; Voice Communication

20050196107 Naval Research Lab., Washington, DC USA
Cognitive Tools for Humanoid Robots in Space
Sofge, Donald; Perzanowski, Dennis; Skubic, Marjorie; Bugajska, Magdalena; Trafton, J. G.; Cassimatis, Nicholas; Brock, Derek; Adams, William; Schultz, Alan; Jan. 2004; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434964; No Copyright; Avail: Defense Technical Information Center (DTIC)

The effective use of humanoid robots in space will depend upon the efficacy of interaction between humans and robots. The key to achieving this interaction is to provide the robot with sufficient skills for natural communication with humans so that humans can interact with the robot almost as though it were another human. This paper describes the design, implementation, and capabilities of a robotic system architecture for a robot which can be used (at some level) to collaborate with a human. The capabilities required of the robot include voice recognition, natural language understanding, gesture recognition, spatial reasoning, and cognitive modeling with perspective-taking. These represent a small subset of potential capabilities humans utilize with one another in collaborating to perform a task in a complex environment, and barely scratches the surface of capabilities that one might want to build into an intelligent, collaborative robot. The capabilities described here have been successfully implemented and demonstrated on several mobile robotic platforms (Sofge, et al., 2004), and the authors are now porting them to Robonaut. They also are extending the capabilities of the cognitive architectures (both ACT-R/S and Polyscheme) and their perspective-taking cognitive models. Future work will focus on enhancing the cognitive models through expanded rule sets and cognitively plausible behaviors and reasoning mechanisms, and adding learning capabilities to the models so that the robots may be able to acquire new knowledge and skills through interaction with humans and while performing tasks.
DTIC
Cognition; Robots; Space Perception

20050196113 Naval Research Lab., Washington, DC USA
GRACE and GEORGE: Autonomous Robots for the AAAI Robot Challenge
Simmons, Reid; Bruce, Allison; Goldberg, Dani; Goode, Adam; Schultz, Alan; Adams, William; Horswill, Ian; Kortenkamp, David; Wolfe, Bryn; Maxwell, Bruce; Jan. 2004; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434971; XB-NRL/MR/5510; No Copyright; Avail: Defense Technical Information Center (DTIC)

In an attempt to solve as much of the AAAI Robot Challenge as possible, five research institutions representing academia, industry and government, integrated their research on a pair of robots named GRACE and GEORGE. This paper describes the second year effort by the GRACE team, the various techniques each participant brought to GRACE, and the integration effort itself.
DTIC
Autonomy; Robots

20050196114 Naval Research Lab., Washington, DC USA
Towards Seamless Integration in a Multi-modal Interface
Perzanowski, Dennis; Adams, William; Schultz, Alan C.; Marsh, Elaine; Jan. 2000; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434973; XB-NRL/MR/5510; No Copyright; Avail: Defense Technical Information Center (DTIC)

We are designing and implementing a multi-modal interface to an autonomous robot. For this interface, we have elected to use natural language and gesture. Gestures can be either natural gestures perceived by a vision system installed on the robot, or they can be made by using a stylus on a Personal Digital Assistant. In this paper we describe how we are attempting to provide a seamless integration of the various modes of input to provide a multi-modal interface that humans can manipulate as they desire. The interface will allow the user to choose whatever mode or combination of modes seems appropriate for interactions with the robot. The human user, therefore, does not have to be limited to any one mode of interaction, but can freely choose whatever mode is most comfortable or natural.
DTIC
Human-Computer Interface; Robots

20050196115 Naval Research Lab., Washington, DC USA
Multi-modal Interfacing for Human-Robot Interaction
Perzanowski, Dennis; Schultz, Alan; Adams, William; Bugajska, Magda; March, Elaine; Jan. 2001; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434974; XB-NRL/MR/5510; No Copyright; Avail: CASI; A03, Hardcopy

CONCLUSIONS: 1. By using 'context predicates' we track actions occurring during a dialog to determine which goals (event and locative) have been achieved or attained and which have not. 2. By tracking 'context predicates' we can determine what actions need to be acted upon next; i.e., predicates in the stack that have not been completed. 3. 'Locative' expressions, e.g. 'there,' give us a kind of handle in command and control applications to attempt error correction when locative goals are being discussed. 4. By interleaving complex dialog with natural and mechanical gestures, we hope to achieve dynamic autonomy and an integrated multi-modal interface.
DTIC
Human-Computer Interface; Robots

20050196116 Naval Research Lab., Washington, DC USA
Agent-based Multimodal Interface for Dynamically Autonomous Mobile Robots
Sofge, Donald; Bugajska, Magdalena; Adams, William; Perzanowski, Dennis; Schultz, Alan; Jan. 2003; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434975; XB-NRL/MR/5510; No Copyright; Avail: Defense Technical Information Center (DTIC)

Agents provide a flexible and scalable method of integrating artificial intelligence techniques on a single cohesive distributed computing system. We have designed and implemented an agent-based interface for autonomous control, and for providing web-based information retrieval, for a dynamically autonomous mobile robot. The robot implements and integrates a variety of artificial intelligence techniques including a multimodal interface that allows natural language understanding, gesture interpretation, simultaneous localization and mapbuilding, object identification and spatial reasoning. The agent-based interface augments these capabilities by providing a method of controlling the robot via the CoABS grid, and by providing the means for the robot/operator to request information available through the grid or through the web.
DTIC
Autonomous Navigation; Autonomy; Human-Computer Interface; Robots

20050196117 Naval Research Lab., Washington, DC USA
Using Spatial Language in a Human-Robot Dialog
Skubic, Marjorie; Perzanowski, Dennis; Schultz, Alan; Adams, William; Jan. 2002; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434976; XB-NRL/MR/5510; No Copyright; Avail: Defense Technical Information Center (DTIC)

In conversation, people often use spatial relationships to describe their environment, e.g., 'There is a desk in front of me and a doorway behind it', and to issue directives, e.g., 'Go around the desk and through the doorway.' In our research, we have been investigating the use of spatial relationships to establish a natural communication mechanism between people and robots, in particular, for novice users. In this paper, the work on robot spatial relationships is combined with a multi-modal robot interface developed at the Naval Research Lab. We show how linguistic spatial descriptions and other spatial information can be extracted from an evidence grid map and how this information can be used in a natural, human-robot dialog.
DTIC
Natural Language (Computers); Robots; Spatial Distribution; Voice Communication

20050196181 Carnegie-Mellon Univ., Pittsburgh, PA USA
Developing a Defense-Centric Attack Taxonomy
Maxion, Roy A.; Killourhy, Kevin S.; Tan, Kymie M.; May 2005; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-1-0228; DARPA ORDER-N900; Proj-N900
Report No.(s): AD-A435079; AFRL-IF-RS-TR-2005-186; No Copyright; Avail: Defense Technical Information Center (DTIC)

Most attack taxonomies are organized from the perspective of attackers' goals. One example of an attacker goal is privilege escalation from user to root. Taxonomies based on attacker goals are attack-centric, largely serving the goals of an attacker, and to a lesser extent, the defender. Defenders need a way of determining whether or not their detectors will detect a given attack. A defense-centric taxonomy may be better suited to this role than an attack centric taxonomy. This research

presents a new, defense-centric attack taxonomy, based on the way that attacks manifest as anomalies in monitored sensor data. The new taxonomy is validated against the manifestations of 25 attacks, as well as against the performance of an intrusion detection system.
DTIC
Computer Networks; Intrusion; Taxonomy; Warning Systems

20050196212 CHI Systems, Inc., Fort Washington, PA USA
Socio-Culturally Oriented Plan Discovery Environment (SCOPE)
Eilbert, Jim; May 2005; 73 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-C-0200; Proj-EELD
Report No.(s): AD-A435120; AFRL-IF-RS-TR-2005-187; No Copyright; Avail: Defense Technical Information Center (DTIC)

Socio-Culturally Oriented Plan Discovery Environment (SCOPE) is a link discovery project in the Evidence Assessment, Grouping, Linking, and Evaluation (EAGLE) program. The primary objective was to model terrorist organization (TO) mission plans from a counter/anti-terrorist (C/AT) point of view by finding links between evidence from disparate sources that currently might be missed. The original SCOPE approach called for using the invariant properties of the TO planning process to create global patterns that could be matched against evidence in intelligence reports. The original SCOPE architecture called for a hybrid system that performed link discovery through a synthesis of cognitive modeling and case-based reasoning (CBR) techniques using CHI Systems' iGEN environment for cognitive modeling, and a variant of SHAI's Intelligent Correlation of Evidence (ICE) system for case-based reasoning (CBR). Chi and their subcontractors (SHAI and Sytex) worked on two very distinct sets of tasks. The first set involved working with intelligence analysts (IAs) and real reports in order to determine the internal patterns used by analysts and how they use them. The second set of tasks involved designing and constructing a cognitive model of the analytic process, and applying it to the plan discovery problem.
DTIC
Models; Planning

20050196231 Naval Research Lab., Washington, DC USA
Goal Tracking in a Natural Language Interface: Towards Achieving Adjustable Autonomy
Perzanowski, Dennis; Schultz, Alan C.; Adams, William; Marsh, Elaine; Jan. 1999; 7 pp.; In English
Report No.(s): AD-A435151; No Copyright; Avail: Defense Technical Information Center (DTIC)

Intelligent mobile robots that interact with humans must exhibit adjustable autonomy; that is, the ability to dynamically adjust the level of self-sufficiency of an agent depending on the situation. When intelligent robots require close interactions with humans, they will require modes of communication that enhance the ability for humans to communicate naturally and that allow greater interaction, as well as adapt as a team member or sole agent in achieving various goals. Our previous work examined the use of multiple modes of communication, specifically natural language and gestures, to disambiguate the communication between a human and a robot. In this paper, we propose using context predicates to keep track of various goals during human-robot interactions. These context predicates allow the robot to maintain multiple goals, each with possibly different levels of required autonomy. They permit direct human interruption of the robot, while allowing the robot to smoothly return to a high level of autonomy.
DTIC
Adjusting; Autonomy; Natural Language (Computers); Robots

20050196232 Navy Center for Applied Research in Artificial Intelligence, Washington, DC USA
An Agent Driven Human-centric Interface for Autonomous Mobile Robots
Sofge, Donald; Perzanowski, Dennis; Bugajska, Magdalena; Adams, William; Schultz, Alan; Jan. 2003; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): MIPR-02-M733-00
Report No.(s): AD-A435154; No Copyright; Avail: Defense Technical Information Center (DTIC)

One of the challenges in implementing a dynamically autonomous mobile robot is achieving a truly human-centric multimodal interface so that human operators can interact with the robot as naturally as they would with another human. Multiple artificial intelligence techniques may be integrated in a distributed computing system through use of an agent-based architecture. In this effort we utilize an agent-based architecture to achieve a multimodal human-centric interface for controlling a dynamically autonomous mobile robot. Capabilities provided by the architecture include natural language

understanding, gesture understanding, localization and mapping for accurate navigation, and use of sensors and maps for spatial reasoning.
DTIC
Autonomy; Human-Computer Interface; Robots

20050196235 Navy Center for Applied Research in Artificial Intelligence, Washington, DC USA
Using a Natural Language and Gesture Interface for Unmanned Vehicles
Perzanowski, Dennis; Schultz, Alan C.; Adams, William; Marsh, Elaine; Jan. 2000; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435161; XB-NRL/MR/5510; No Copyright; Avail: Defense Technical Information Center (DTIC)

Unmanned vehicles, such as mobile robots, must exhibit adjustable autonomy. They must be able to be self-sufficient when the situation warrants; however, as they interact with each other and with humans, they must exhibit an ability to dynamically adjust their independence or dependence as co-operative agents attempting to achieve some goal. This is what we mean by adjustable autonomy. We have been investigating various modes of communication that enhance a robot's capability to work interactively with other robots and with humans. Specifically, we have been investigating how natural language and gesture can provide a user-friendly interface to mobile robots. We have extended this initial work to include semantic and pragmatic procedures that allow humans and robots to act co-operatively, based on whether or not goals have been achieved by the various agents in the interaction. By processing commands that are either spoken or initiated by clicking buttons on a Personal Digital Assistant and by gesturing either naturally or symbolically, we are tracking the various goals in the interaction, the agent involved in the interaction, and whether or not the goal has been achieved. The various agents involved in achieving the goals are each aware of their own and others' goals and what goals have been stated or accomplished so that eventually any member of the group, be it a robot or a human, if necessary, can interact with the other members to achieve the stated goals of a mission.
DTIC
Natural Language (Computers); Robots

20050196260 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Analysis of Perturbed Quantization Steganography in the Spatial Domain
Spisak, Matthew D.; Mar. 2005; 129 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435207; AFIT/GIA/ENG/05-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

Steganography is a form of secret communication in which a message is hidden into a harmless cover object, concealing the actual existence of the message. Due to the potential abuse by criminals and terrorists, much research has also gone into the field of steganalysis - the art of detecting and deciphering a hidden message. As many novel steganographic hiding algorithms become publicly known, researchers exploit these methods by finding statistical irregularities between clean digital images and images containing hidden data. This creates an on-going race between the two fields and requires constant countermeasures on the part of steganographers in order to maintain truly covert communication. This research effort extends upon previous work in perturbed quantization (PQ) steganography by examining its applicability to the spatial domain. Several different information-reducing transformations are implemented along with the PQ system to study their effect on the security of the system as well as their effect on the steganographic capacity of the system. Additionally, a new statistical attack is formulated for detecting +/- 1 embedding techniques in color images. Results from performing state-of-the-art steganalysis reveal that the system is less detectable than comparable hiding methods. Grayscale images embedded with message payloads of 0.4bpp are detected only 9% more accurately than by random guessing, and color images embedded with payloads of 0.2bpp are successfully detected only 6% more reliably than by random guessing.
DTIC
Image Processing; Measurement; Perturbation; Security; Steganography

20050196548 NASA Glenn Research Center, Cleveland, OH, USA
Adaptive Controls Method Demonstrated for the Active Suppression of Instabilities in Engine Combustors
Kopasakis, George; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

An adaptive feedback control method was demonstrated that suppresses thermoacoustic instabilities in a liquid-fueled combustor of a type used in aircraft engines. Extensive research has been done to develop lean-burning (low fuel-to-air ratio) combustors that can reduce emissions throughout the mission cycle to reduce the environmental impact of aerospace

propulsion systems. However, these lean-burning combustors are susceptible to thermoacoustic instabilities (high-frequency pressure waves), which can fatigue combustor components and even the downstream turbine blades. This can significantly decrease the safe operating lives of the combustor and turbine. Thus, suppressing the thermoacoustic combustor instabilities is an enabling technology for lean, low-emissions combustors under NASA's Propulsion and Power Program. This control methodology has been developed and tested in a partnership of the NASA Glenn Research Center, Pratt & Whitney, United Technologies Research Center, and the Georgia Institute of Technology. Initial combustor rig testing of the controls algorithm was completed during 2002. Subsequently, the test results were analyzed and improvements to the method were incorporated in 2003, which culminated in the final status of this controls algorithm. This control methodology is based on adaptive phase shifting. The combustor pressure oscillations are sensed and phase shifted, and a high-frequency fuel valve is actuated to put pressure oscillations into the combustor to cancel pressure oscillations produced by the instability.
Derived from text
Adaptive Control; Combustion Chambers; Engine Control; Feedback Control; Pressure Regulators

20050196576 Massachusetts Inst. of Tech., Cambridge, MA USA
A Robot in a Box
Arsenio, Artur M.; Jan. 2001; 6 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434699; No Copyright; Avail: Defense Technical Information Center (DTIC)
Pervarsive robotics will require small, light and cheap robots that exhibit complex behaviors. Design flexibility, a modular software/hardware architecture and a large repertoire of functionalities are all requirements for such a comprehensive vision system. These demands led to the development of the M2-M4 Macaco project - a robotic active vision head. Macaco is a portable system, capable of emulating the head of different creatures both aesthetically and functionally. It integrates mechanisms for social interactions, autonomous navigation and object analysis.
DTIC
Robots; Autonomous Navigation; Computer Vision

20050196579 Massachusetts Inst. of Tech., Cambridge, MA USA
Challenges in Building Robots that Imitate People
Breazeal, Cynthia; Scassellati, Brian; Jan. 2000; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-99-1-0012; N00014-95-1-0600
Report No.(s): AD-A434732; No Copyright; Avail: Defense Technical Information Center (DTIC)
Human (and some other animals) acquire new skills socially through direct tutelage, observational conditioning, goal emulation, imitation, and other methods (Galef, 1988; Hauser, 1996). These social learning skills provide a powerful mechanism for an observer to acquire behaviors and knowledge from a skilled individual (the model). In particular, imitation is an extremely powerful mechanism for social learning which has received a great deal of interest from researchers in the fields of animal behavior and child development.
DTIC
Robots; Growth

20050196580 Massachusetts Inst. of Tech., Cambridge, MA USA
Head Pose Estimation Without Manual Initialization
Fitzpatrick, Paul; Jan. 2000; 10 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434817; No Copyright; Avail: Defense Technical Information Center (DTIC)
This paper describes a fully automatic system for recovering the rigid components of head pose. It follows the conventional approach of tracking pose changes relative to a reference configuration. Rather than being supplied manually, here the reference configuration is determined by directly estimating pose from the image when the head is close to a frontal presentation. Tracking of pose is done in an intermediate coordinate system which minimizes the impact of errors in estimates of the 3D shape of the head being tracked.
DTIC
Robotics; Estimates; Coordinates

20050196581 Naval Research Lab., Washington, DC USA
'Excuse me, where's the registration desk?' Report on Integrating Systems for the Robot Challenge AAAI 2002
Perzanowski, Dennis; Schultz, Alan C.; Adams, William; Bugajska, Magda; Abramson, M.; MacMahon, M.; Atrash, A.; Coblenz, M.; Jan. 2002; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434940; No Copyright; Avail: Defense Technical Information Center (DTIC)

In July and August 2002, five research groups -- Carnegie Mellon University, Northwestern University, Swarthmore College, Metrica, Inc., and the Naval Research Laboratory -- collaborated and integrated their various robotic systems and interfaces to attempt The Robot Challenge held at the AAAI 2002 annual conference in Edmonton, Alberta. The goal of this year's Robot Challenge was to have a robot dropped off at the conference site entrance; negotiate its way at the site, using queries and interactions with humans and visual cues from signs, to the conference registration area; register for the conference; and then give a talk. Issues regarding human/robot interaction and interfaces, navigation, mobility, vision, to name but a few relevant technologies to achieve such a task, were put to the test. In this report we, the team from the Naval Research Laboratory, will focus on our portion of The Robot Challenge. We will discuss some lessons learned from collaborating and integrating our system with our research collaborators, as well as discuss what actually transpired -- what worked and what failed -- during the robot's interactions with conference attendees in achieving goals. We will also discuss some of the informal findings and observations collected at the conference during the interaction and navigation of the robot to complete its various goals.
DTIC
Robots; Systems Integration

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20050188657 Delaware State Univ., Dover, DE USA
Generalized Hartree-Fock Approach to the (e,2e) Processes
Zerrad, Essaid; Jan. 2002; 12 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0446; Proj-4113
Report No.(s): AD-A434300; AFRL-SR-AR-TR-05-0193; No Copyright; Avail: CASI; A03, Hardcopy

Our results for the singlet case are reported shows that the singlet case is more problematic, as the existing theories are not all in agreement. Since the GHF is quite distinct from all the other approaches and based on the potentially powerful SCF approach, further analyses should help clarify the situation. A part of our study in progress includes an extension of additional channels in the total wave function to test the convergence of the theory. We adopt a vartiational procedure to improve on the ionization differential cross section. This work will be reported elsewhere.
DTIC
Hartree Approximation; Wave Functions

20050188695 Phillips Lab., Hanscom AFB, MA USA
Counting Lattice-Gas Invariants
Yepez, Jeffrey; Oct. 1993; 7 pp.; In English
Report No.(s): AD-A434353; No Copyright; Avail: CASI; A02, Hardcopy

Summarized is a method to count the number of invariants in a lattice-gas automata. A simple calculation proves that a deterministic FHP lattice-gas with a definite chirality, possesses only three invariants: the total mass and the two components of momentum. This model in somewhat simpler than FHP and is time reversible.
DTIC
Counting; Lattice Vibrations

20050188696 Johns Hopkins Univ., Baltimore, MD USA
Quantitative Uncertainty Assessment and Numerical Simulation of Micro-Fluid Systems
Knio, Omar M.; Ghanem, Roger G.; Matta, Alain; Najm, Habib N.; Debusschere, Bert; LeMaitre, Olivier P.; Apr. 2005; 175 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0612; DARPA ORDER-J406; Proj-E117
Report No.(s): AD-A434355; AFRL-IF-RS-TR-2005-143; No Copyright; Avail: CASI; A08, Hardcopy

A stochastic multidimensional code is constructed for the simulation of a multi-component reacting mixture in pressure and electrokinetically-driven microchannel flows. The code is based on a detailed physical formulation that incorporates realistic models for the dependence of mixture properties on local species concentrations, the variation of the zetapotential with local mixture conditions, and buffer behavior. The stochastic formulation relies on a spectral representation of uncertain quantities, and thus enables propagation and quantification of uncertainty in model parameters and/or operating conditions. Polynomial Chaos (PC) decompositions are used for this purpose, and are used in conjunction with a Galerkin methodology. The new modeling and decision-support capabilities resulting from the combination of a detailed physical model with accurate and efficient uncertainty quantification formalism are demonstrated, in particular, through application of the stochastic code to transient computations of protein-labeling reactions in two-dimensional electrochemical microchannel flow. Thus, this project has established highly efficient uncertainty quantification schemes that are ideally suited for micro-fluidic flows that arise, in particular, in bio-sensing and detection. By adopting a flexible computational methodology, the presently developed UQ tools may be readily adapted to assist in design, evaluation and/or deployment of a wide class of flow devices. Consequently, the impact of the present effort naturally extends well beyond the scope of its immediate applications.
DTIC
Channel Flow; Stochastic Processes

20050188706 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Environmental Acoustic Transfer Functions and the Filtering of Acoustic Signals
Dias, Brandon P.; Mar. 2005; 75 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434368; AFIT/GAM/ENC/05-2; No Copyright; Avail: Defense Technical Information Center (DTIC)

Signal processing is the method of taking a given signal and extracting useful information, usually by a means of a transformation of some kind. Acoustic signals are functions of time in which the output is a pressure or a velocity potential response. An acoustic signal is affected by the environment in which it propagates, so one can attempt to remove the environmental effects to extract the useful information, in this case the original signal. This thesis will derive, in a mathematical framework, the process of filtering extraneous signals in a way that yields the original signal, and will then apply this process to the Cocktail Party Problem in an attempt to describe how useful this ability can be. This ability has many applications in both the Department of Defense and commercial industries. Considering an acoustic signal to be a form of information, the basic purpose of filtering the received signal is to retrieve the original information, such as in intelligence gathering. The private sector also has many uses for this method. Consider a boardroom meeting transpiring in a room. While at most times, there will only be one person talking, there may be at other times many people talking at once, arguing with each other. This is when the application of this signal processing will become most useful. An acoustic signal can be distorted in a number of ways by an environment, thereby making information contained within the signal less accessible. The effect of the environment must be determined to retrieve the original information. This thesis pursues those goals by finding solutions to the following three problems: finding and inverting the room transfer function, filtering different signals being transmitted at once, and retrieving the signal of a mobile source.
DTIC
Atmospheric Attenuation; Linear Filters; Signal Processing; Signal Transmission; Sound Waves; Transfer Functions; Wave Equations

20050188802 Minnesota Univ., Minneapolis, MN USA
Computational Electromagnetics
Reitich, Fernando; Dec. 2004; 15 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0052
Report No.(s): AD-A434574; AFRL-SR-AR-TR-05-0234; No Copyright; Avail: CASI; A03, Hardcopy

The objective of the effort sponsored by the present contract consists of the development of a suite of numerical algorithms, founded on a rigorous mathematical basis for the accurate and efficient prediction of electromagnetic scattering returns. The techniques are based on Integral equations, perturbation theory and high frequency approximations; general numerical methods will be sought through suitable combinations of these.
DTIC
Computational Electromagnetics; Electromagnetic Scattering; Electromagnetism; Integral Equations; Numerical Analysis; Perturbation Theory

20050188803 Calabazas Creek Research, Inc., Saratoga, CA USA
Virtual Laboratory Environment for High Voltage Radiation Source Experiments
Bui, Thuc; May 2005; 33 pp.; In English
Contract(s)/Grant(s): FA9550-04-C-0069; Proj-STTR
Report No.(s): AD-A434576; AFRL-SR-AR-TR-05-0240; No Copyright; Avail: CASI; A03, Hardcopy

CCR and UCB have achieved the Phase I overall technical objective, which was to demonstrate the feasibility of a computational virtual laboratory for simulating high voltage effects. Models in support of this objective were identified and defined in Phase I, with some components implemented in the one-dimensional object oriented code, and others implemented directly in the 2D code. The 1D code serves as a platform for rapid prototyping of new algorithms. The simplicity of the 1D code ensures that the algorithm or model remains the focus, rather than the mathematical and programming details of multi-dimensional implementation. Modes of the formation of a moving plasma cathode interface, scattering of energetic electrons, high voltage breakdown of insulator surfaces, intense heat fluxes to surfaces, generation of x-rays and an intuitive and user friendly graphical user interface were described and ready for implementation.
DTIC
High Voltages; Laboratories; Radiation Sources; Simulation; Virtual Reality

20050188850 University of North Texas, Denton, TX USA
Aging and Rejuvenation with Fractional Derivatives
Grigolini, Paolo; Aquino, Gerardo; Bologna, Mauro; West, Bruce; Sep. 2004; 12 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0037
Report No.(s): AD-A434831; G73029; No Copyright; Avail: Defense Technical Information Center (DTIC)

We discuss a dynamic procedure that makes fractional derivatives emerge in the time asymptotic limit of non-Poisson processes. We find that two-state fluctuations, with an inverse power-law distribution of waiting times, finite first moment, and divergent second moment, namely, with the power index micro in the interval 2 \h micro \h 3, yield a generalized master equation equivalent to the sum of an ordinary Markov contribution and a fractional derivative term. We show that the order of the fractional derivative depends on the age of the process under study. If the system is infinitely old, the order of the fractional derivative, alpha, is given by o=3 micro.
DTIC
Calculus; Derivation; Equations

20050192599 Tbilisi State Univ., USSR
Mathematical Modelling of Problems of Control Theory, Elasticity Theory, Hydro-Thermodynamics, and Statistics Connected with the Terrorist Attacks and Defence against Terrorism
Davitashvili, Teimuraz; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 17-1 - 17-24; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Unfortunately, terrorist attacks became very frequent recently. Terrorism is an unacceptable form of expression of fight and protest, since in the result mainly die and suffer absolutely innocent population. The number of the countries, where terrorist attacks have had place in the last decade, is very large. Unfortunately, Georgia is among them (terrorist attacks on gas and oil pipelines, thermo- and hydro power plants, power transmission lines, railways carrying the oil, Georgian President, local and foreign citizens and so on). The fight against terrorism, development of the defensive mechanisms against terrorist attacks and prognosis of the possible damage and pollution of the environment as a result of these attacks became a prior problem of the modern science. Mathematical modelling represents a quite convenient and powerful mean to investigate the defence policies against terrorist attacks, as well as the possible results of the terrorist attack. Here we present the list of the themes, connected with the defence against terrorism, which have been developed and investigated in the I.Vekua Institute of Applied Mathematics of the Tbilisi State University:
Author
Control Theory; Mathematical Models; Thermodynamics; Terrorism; Pipelines; Damage

20050195960 Robust Analysis, Inc., Takoma Park, MD USA
Efficient Numerical Methods for Stable Distributions
Nolan, John P.; Jun. 2003; 17 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00421-03-P-0059
Report No.(s): AD-A434737; SBIR-7; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objectives of the contract were to develop computational methods for stable distributions. This section will describe the work performed and the results obtained, organized by topics in approximate chronological order. The second section discusses technical feasibility of Phase II work, and a short third section discusses miscellaneous issues. We note that there is more extensive documentation on these topics in the monthly reports and delivered software. The six monthly reports, the extensive report on simulations evaluating parameter estimation methods, and the user manual for the STABLE matlab interface totaled over 200 pages of detailed information. The information below is a summary of that work, it is not intended as a complete record.
DTIC
Estimates; Independent Variables; Numerical Analysis

20050195972 Massachusetts Inst. of Tech., Cambridge, MA USA
The Essential Dynamics Algorithm: Essential Results
Martin, Martin C.; May 2003; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DABT63-00-C-10102
Report No.(s): AD-A434755; AI-MEMO-2003-014; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents a novel algorithm for learning in a class of stochastic Markov decision processes (MDPs) with continuous state and action spaces that trades speed for accuracy. A transform of the stochastic MDP into a deterministic one is presented which captures the essence of the original dynamics, in a sense made precise. In this transformed MDP, the calculation of values is greatly simplified. the online algorithm estimates the model of the transformed MDP and simultaneously does policy search against it. Bounds on the error of this approximation are proven, and experimental results in a bicycle riding domain are presented. The algorithm learns near optimal policies in orders of magnitude fewer interactions with the stochastic MDP, using less domain knowledge.
DTIC
Algorithms; Decision Making; Learning; Markov Processes; Robotics; Stochastic Processes

20050196005 North Dakota State Univ., Fargo, ND USA
Cooperative Control of Multiple Unmanned Autonomous Vehicles
Nygard, Kendall E.; Jun. 2005; 27 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0337
Report No.(s): AD-A434808; AFRL-SR-AR-TR-05-0243; No Copyright; Avail: CASI; A03, Hardcopy

The decision for an autonomous Unmanned Air Vehicle(VA-9 to strike a target is an important one that has important consequences. The details regarding the decision and the process of deciding need to be well defined and understood. This paper presents a Petri net approach to UA V decision making based on fuzzy reasoning. It shows that Petri nets are a viable tool for modeling and validating propositional logic for rule-based reasoning in UA V decisions. It also discusses alternative methods for modeling places a input sources for transitions representing rules.
DTIC
Autonomy; Decision Making; Drone Vehicles; Models; Planning; Policies

20050196075 University of North Texas, Denton, TX USA
Correlation Function and Generalized Master Equation of Arbitrary Age
Allegrini, Paolo; Aquino, Gerardo; Grigolini, Paolo; Palatella, Luigi; Rosa, Angelo; West, Bruce J.; Jun. 2005; 13 pp.; In English
Contract(s)/Grant(s): DAAD-19-02-1-0037
Report No.(s): AD-A434920; G73029; ARO-43731.21-MA; No Copyright; Avail: Defense Technical Information Center (DTIC)

We study a two-state statistical process with a non-Poisson distribution of sojourn times. In accordance with earlier work, we find that this process is characterized by aging and we study three different ways to define the correlation function of arbitrary age of the corresponding dichotomous fluctuation. These three methods yield exact expressions, thus coinciding with the recent result by Godreche and Luck J. Stat. Phys. 104, 489 (2001). Actually, non-Poisson statistics yields infinite memory at the probability level, thereby breaking any form of Markovian approximation, including the one adopted herein, to find an approximated analytical formula. For this reason, we check the accuracy of this approximated formula by comparing it with the numerical treatment of the second of the three exact expressions. We find that, although not exact, a simple analytical expression for the correlation function of arbitrary age is very accurate. We establish a connection between the correlation

function and a generalized master equation of the same age. Thus this formalism, related to models used in glassy materials, allows us to illustrate an approach to the statistical treatment of blinking quantum dots, bypassing the limitations of the conventional Liouville treatment.
DTIC
Correlation; Statistical Analysis

20050196146 Towson Univ., Towson, MD USA
Simulation of Quantum Time-Frequency Transform Algorithms
Lu, Chao; Jun. 2005; 16 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-0406
Report No.(s): AD-A435027; AFRL-SR-AR-TR-05-0245; No Copyright; Avail: CASI; A03, Hardcopy

The demand for exact computation in scientific fields related to quantum physics is not met by the Symbolic Math Toolbox developed in MATLAB. In particular, exact evaluation rational multiples of 2 square is at the heart of efficient implementation of quantum time-frequency transforms. Computations performed using this Toolbox generate erroneous results when used with numbers with more than twenty digits in length. Furthermore, the results of our investigation lead us to believe that floating-point operations may be used during the computing process of this Toolbox. The Exact Computing system introduced in this report yields significant decreases in computation times, as well as providing an exact method of storing and computing data. In this system, exact values are obtained by storing numbers as numerator and denominator of rational numbers'. Integers can be of any length. We define a data structure of rational matrices using rational numbers and a set of related operators. We also started to use alternative approach to represent all integers and rational numbers in terms of a set of residues with respect to a prime number and its powers, called a p-adic number system. The p-adic arithmetic has many attractive features.
DTIC
Algorithms; Frequencies; Mathematical Models; Quantum Theory; Simulation

20050196215 Notre Dame Univ., IN USA
Real-Time Configuration of Networked Embedded Systems
Liuzzi, Raymond A.; Antsaklis, Panos; May 2005; 424 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-2-0526; DARPA ORDER-L546; Proj-NEST
Report No.(s): AD-A435123; AFRL-IF-RS-TR-2005-190; No Copyright; Avail: Defense Technical Information Center (DTIC)

This project focused on the development of synchronization algorithms and software for a network of MICA (or Berkeley) motes. Automata and Petri net models of operational aspects were derived and verification techniques were used to guarantee correctness. A major part of this project was dedicated tot the Red Force Tagging or Tag Mote project. This report describes detailed descriptions of the developed TagMote hardware, software and algorithms. This report also describes fundamental contributions to the communications in wireless sensor networks. The networking results address issues brought forth because of the increasing number of sensor nodes in applications of interest. Also in this project, new results are described on overload management of distributed control to address problems arising in the fairing application of Boeing. In summary, the first part of this report describes the Red Force Tagging project, while the second part describes the Networking research results. The appendices contain further information and copies of publications. Copies of PI presentations are also included.
DTIC
Algorithms; Real Time Operation

20050196217 Duke Univ., Durham, NC USA
Swarming in Two and Three Dimensions
Bertozzi, Andrea L.; May 2005; 6 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0055
Report No.(s): AD-A435127; ARO-43719.12-MA; No Copyright; Avail: Defense Technical Information Center (DTIC)

The future of military action will increasingly require new methods based on 'swarming' tactics in which a multitude of small units or 'pods' can operate in clusters with an overlaying network transmitting information. This project aims at developing concise spatio-temporal models of the large scale dynamics of swarm. The focus is on 'fluid-like' swarms in which the individual units have fairly distributed but localized density. The models have some connection to classical problems in fluid dynamics, with a potential for a richer structure arising from cooperativity between units in the swarm and from

self-propulsion of individual units. The justification of the models is based on the internal dynamics swarming as opposed to classical principles of physical fluid flow. Models will be tested against numerical particle-based (Lagrangian) simulations and will be compared with known behavior from biological swarms such as locusts, ants, and fish. This biology-based portion of this research project will include collaboration with Mark Lewis, the Canada Research Chair of Mathematical Biology at the Univ. of Alberta. The second part of this program involves bio-engineering motivated' design of swarm'. We consider the inverse problem: given a large scale dynamics for a swarm, how can one design individual motion to achieve this outcome? Our approach is to start with continuum models designed to have desired solutions. We will use knowledge gained from the biological models to derive swarming algorithms that could have both military and industrial use. The designed swarms will include and additional component not present in biological models, that of a communications network distributed among the swarmer subgroups that will facilitate operations.
DTIC
Models; Swarming

20050196236 Rensselaer Polytechnic Inst., Troy, NY USA
Adaptive Computation and Modeling for Multiscale Analysis
May 2005; 10 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0655
Report No.(s): AD-A435164; RPI-J11148-FINAL; ARO-41645.1-MA; No Copyright; Avail: CASI; A02, Hardcopy

Algorithms and software for the adaptive solution of multiscale problems involving partial differential equations and linkage to atomic level simulations. Efforts focused on techniques for using the discontinuous Galerkin method to solve hyperbolic and singularly perturbed parabolic problems. New anisotropic adaptive and parallel solution techniques, a posteriori error estimation strategies, limiting procedures that reduce spurious oscillations near discontinuities, and discontinuity detection strategies that reduce the need for limiting, thereby reducing both excess diffusion and spurious oscillations were developed. The software and methods are being tested on a variety of problems involving compressible flows. In collaboration with engineers at Benet Laboratories, we have been investigating muzzle blast from cannons with perforated brakes. A new procedure to couple atomic/continuum level adaptive simulations was developed and demonstrated on test problems. Scale error indicators have developed and adaptive construction of local atomic regions demonstrated.
DTIC
Algorithms; Computation; Error Analysis; Finite Element Method; Galerkin Method; Hyperbolic Differential Equations

20050196240 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Evaluation of the Ad Hoc On-Demand Distance Vector Routing Protocol for Mobile Ad Hoc Networks
Rickmon, Amber J.; Mar. 2005; 88 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435177; AFIT/GCS/ENG/05-15; No Copyright; Avail: Defense Technical Information Center (DTIC)

Routing protocols designed for wired networks cannot be used in mobile ad hoc networks (MANETs) due to the dynamic topology, limited throughput, and energy constraints. New routing protocols have been designed for use in MANETs, but have not been thoroughly tested under realistic conditions such as node movement, number of sources, the presence of obstacles, and node speed. This research evaluates the performance of ad hoc on-demand distance vector routing with respect to throughput, goodput ratio, end-to-end (ETE) delay, node pair packet delivery rate, and node pair end-to-end delay. It shows these performance metrics vary significantly according to the choice of mobility model, number of sources, and the presence or absence of obstacles. The mobility model explains 68% of the variation in node pair packet delivery rate. The mobility model explains between 8% and 53% of variation in the other performance metrics. Obstacles explain between 5% and 24% of variation, and have the greatest effect on ETE delay. Finally, the number of sources explains between 8% and 72% of variation in node pair ETE delay, throughput, goodput ratio, and node pair packet delivery rate. The number of sources does not have a significant affect on ETE delay.
DTIC
Networks; Protocol (Computers); Vector Analysis

20050196249 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Weapon Release Scheduling from Multiple-Bay Aircraft using Multi-Objective Evolutionary Algorithms
Lyons, Francis R.; Mar. 2005; 65 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435191; AFIT/GCE/ENG/05-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

The USA Air Force has put an increased emphasis on the timely delivery of precision weapons. Part of this effort has been

to us multiple bay aircraft such the B-1B Lancer and B-52 Stratofortress to provide Close Air Support and responsive strikes using 1760 weapons. In order to provide greater flexibility, the aircraft carry heterogeneous payloads which can require deconfiction in order to drop multiple different types of weapons. Current methods of deconfiction and weapon selection are highly crew dependant and work intensive. This research effort investigates the optimization of an algorithm for weapon release which allows the aircraft to perform deconfiction automatically. This reduces crew load and response time in order to deal with time-sensitive targets. The overall problem maps to the Job-Shop Scheduling problem. Optimization of the algorithm is done through the General Multiobjective Parallel Genetic Algorithm (GENMOP). We examine the results from pedagogical experiments and real-world test scenarios in the light of improving decision making. The results are encouraging in that the program proves capable of nding acceptable release schedules, however the solution space is such that applying the program to real world situations is unnecessary. We present visualizations of the schedules which demonstrate these conclusions.
DTIC
Algorithms; Scheduling

20050196273 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Multiple Model Adaptive Estimator Target Tracker for Maneuvering Targets in Clutter
Smith, Brian D.; Mar. 2005; 313 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435250; AFIT/GE/ENG/05-18; No Copyright; Avail: Defense Technical Information Center (DTIC)

The task of tracking a target in the presence of measurement clutter is a two-fold problem: one of handling measurement association uncertainty (due to clutter), and poorly known or significantly varying target dynamics. Measurement association uncertainty does not allow conventional tracking algorithms (such as Kalman filters) to be implemented directly. Poorly known or varying target dynamics complicate the design of any tracking filter, and filters using only a single dynamics model can rarely handle anything beyond the most benign target maneuvers. In recent years, the Multiple Hypothesis Tracker (MHT) has gained acceptance as a means of handling targets in a measurement-clutter environment. MHT algorithms rely on Gaussian mixture representations of a target's current state estimate, and the number of components within these mixtures grows exponentially with each successive sensor scan. Previous research into techniques that limit the growth of Gaussian mixture components proved that the Integral Square Error cost-function-based algorithm performs well in this role. Also, multiple-model adaptive algorithms have been shown to handle poorly known target dynamics or targets that exhibit a large range of maneuverability over time with excellent results. This research integrates the ISE mixture reduction algorithm into Multiple-Model Adaptive Estimator (MMAE) and Interacting Mixed Model (IMM) tracking algorithms. The algorithms were validated to perform well at a variety of measurement clutter densities by using a Monte Carlo simulation environment based on the C++ language. Compared to single-dynamics-model MHT trackers running against a maneuvering target, the Williams-filter-based, multiple-model algorithms exhibited superior tracking performance.
DTIC
Algorithms; Clutter; Maneuvers; Measurement; Targets; Tracking (Position)

20050196753 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Matrix Lower Bound
Grear, J. F.; January 2005; 40 pp.; In English
Report No.(s): DE2005-836372; LBNL-50635; No Copyright; Avail: Department of Energy Information Bridge

A matrix lower bound is defined that generalizes ideas apparently due to S. Banach and J. von Neumann. The matrix lower bound has a natural interpretation in functional analysis, and it satisfies many of the properties that von Neumann stated for it in a restricted case. Applications for the matrix lower bound are demonstrated in several areas. In linear algebra, the matrix lower bound of a full rank matrix equals the distance to the set of rank-deficient matrices. In numerical analysis, the ratio of the matrix norm to the matrix lower bound is a condition number for all consistent systems of linear equations. In optimization theory, the matrix lower bound suggests an identity for a class of min-max problems. In real analysis, a recursive construction that depends on the matrix lower bound shows that the level sets of continuously differential functions lie asymptotically near those of their tangents.
NTIS
Matrix Theory; Neumann Problem; Banach Space

20050196813 Brookhaven National Lab., Upton, NY, USA
Matrix Product Variational Formulation for Lattice Gauge Theory
Sugihara, T.; January 2005; 10 pp.; In English
Report No.(s): DE2005-15011145; BNL-73567-2005; No Copyright; Avail: Department of Energy Information Bridge

For hamiltonian lattice gauge theory, we introduce the matrix product ansatz inspired from density matrix renormalization group. In this method, wavefunction of the target state is assumed to be a product of finite matrices. As a result, the energy becomes a simple function of the matrices, which can be evaluated using a computer. The minimum of the energy function corresponds to the vacuum state. We show that the S = 1/2 Heisenberg chain model are well described with the ansatz. The method is also applied to the two-dimensional S = 1/2 Heisenberg and U(1) plaquette chain models.
NTIS
Matrices (Mathematics); Gauge Theory; Hamiltonian Functions

20050198883 Cranfield Univ., Bedford, UK
On Minimizing Maximum Transient Energy Growth
Whidborne, James F.; McKeman, John; Steer, Anthony J.; June 2005; 22 pp.; In English
Report No.(s): COA-0501; Copyright; Avail: Other Sources

The problem of minimizing the maximum transient energy growth is considered. This problem has importance in some fluid flow control problems and other classes of non-linear systems. Conditions for the existence of static controllers that restrict the maximum transient energy growth to unity are established. An explicit parametrization of all linear controllers ensuring monotonic decrease of the transient energy is derived. It is shown that by means of a Q-parametrization, the problem of minimizing the maximum transient energy growth can be posed as a convex optimization problem that can be solved by means of a Ritz approximation of the free parameter. By considering the transient energy growth at an appropriate sequence of discrete time points, the minimal maximum transient energy growth problem can be posed as a semidefinite problem. The theoretical developments are demonstrated on two numerical problems.
Author
Probability Distribution Functions; Parameter Identification; Numerical Analysis; Nonlinearity

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20050188587 Space and Naval Warfare Systems Center, San Diego, CA USA
Evolutionary Control of an Autonomous Field
Owen, Mark W.; Klamer, Dale M.; Dean, Barbara; Aug. 2001; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434201; No Copyright; Avail: CASI; A03, Hardcopy

An autonomous field of sensor nodes must acquire and track targets of interest traversing the field. Small detection ranges limit the detectability of the field. As detections occur in the field, detections are transmitted acoustically to a master node. Both detection processing and acoustic communication drain a node's power source. To maximize field life, an approach must be developed to control processes carried out in the field. This paper presents an adaptive threshold control scheme that minimizes power consumption while still maintaining the field-level probability of detection. The power consumption of the field of sensor nodes is driven by the false alarm rate and target detection rate at the individual sensor nodes in this problem formulation. The control law to be developed is based on a stochastic optimization technique known as evolutionary programming. Results show that by dynamically adjusting sensor thresholds and routing structures, the controlled field will have twice the life of the fixed field.
DTIC
Adaptive Control; Autonomy; Detection; Energy Consumption; Stochastic Processes; Target Acquisition

20050188602 Air Force Research Lab., Eglin AFB, FL USA
Convergence Properties of Continuous-Time Markov Chains with Application to Target Search
Jun, Myungsoo; Jeffcoat, David E.; May 2005; 7 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0170; Proj-2304
Report No.(s): AD-A434223; AFRL-MN-EG-TP-2005-7404; No Copyright; Avail: CASI; A02, Hardcopy

This paper considers the search for targets modeled as a discrete state, continuous-time Markov process. Convergence properties are analyzed using the eigenvalues and eigenvectors of a state transition rate matrix without explicitly solving

differential equations or calculating matrix exponentials. It also studies the effect of cueing on convergence rate using eigenvalue analysis and optimal control theoretic approach.
DTIC
Convergence; Detection; Markov Chains; Markov Processes; Target Acquisition; Targets

20050188851 University of North Texas, Denton, TX USA
Report on the Research Activities Done for the Project 73209 - Mathematics of Complex Dynamical Systems, Second Part
Grigolini, Paolo; Jan. 2005; 3 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0037
Report No.(s): AD-A434834; G73029; ARO-43731.17-MA; No Copyright; Avail: Defense Technical Information Center (DTIC)

(1)---The search for invisible and crucial events. We have found 1 that the model of ballistic deposition can be interpreted as a diffusion process subordinated to ordinary diffusion. This suggests that there exist invisible crucial events. These events are unpredictable, thereby contributing an entropy increase, and enforcing a deterministic prescription on the events revealed by the experimental observation. On the basis of these results the PI's group is developing a theory for the systematic search of invisible and crucial events. (2)---The Physics of non-Poisson processes. The original motivation for the research work, whose results are here illustrated, is the conflict between the ordinary approaches to non-equilibrium statistically physics, based on the time evolution of a bunch of trajectories, density perspective, and the approach based on the time evolution of an individual trajectory, with erratic and unpredictable jumps, trajectory perspective.
DTIC
Complex Systems; Dynamical Systems; Poisson Density Functions; Statistical Mechanics; Stochastic Processes; Theoretical Physics

20050194636 Columbia Univ., New York, NY, USA
Kernel Principle Componenet Analysis of Microarray Data
Haghighi, F.; Nov. 2003; 12 pp.; In English
Report No.(s): DE2005-823317; No Copyright; Avail: Department of Energy Information Bridge

Given the limitations in the quantity and quality of gene expression array data, the focus of the research was shifted to development of statistical and computation, I tools for evaluation and detection of disease susceptibility mutations within a large set of individuals or even an entire population. The diseases that are of particular interest are those with complex etiology, involving interaction of multiple genes and/or environmental factors. Such diseases (e.g., cardiovascular diseases, psychiatric illnesses, etc.) are common in the human population. Research towards the discovery of the genetic basis of these complex diseases is of major public health importance.
NTIS
Diseases; Etiology; Genes; Kernel Functions

20050196066 University of North Texas, Denton, TX USA
Non-Poisson Dichotomous Noise: Higher-Order Correlation Functions and Aging
Allegrini, Paolo; Grigolini, Paolo; Palatella, Luigi; West, Bruce J.; Oct. 2004; 10 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0037
Report No.(s): AD-A434898; G73029; ARO-43731.1-MA; No Copyright; Avail: CASI; A02, Hardcopy

The authors study a two-state symmetric noise, with a given waiting time distribution psi(tau), and focus their attention on the connection between the four-time and two-time correlation functions. The transition of psi(tau) from the exponential to the nonexponential condition yields the breakdown of the usual factorization condition of higher-order correlation functions, as well as the birth of aging effects. The authors discuss the subtle connections between these two properties and establish the condition that the Liouville-like approach has to satisfy to produce a correct description of the resulting diffusion process.
DTIC
Correlation; Mathematical Models; Statistical Mechanics; Stochastic Processes

20050196103 Naval Research Lab., Washington, DC USA
Spatial Language for Human-Robot Dialogs
Skubic, Marjorie; Perzanowski, Dennis; Blisard, Sam; Schultz, Alan; Adams, William; Bugajska, Magda; Brock, Derek; Jan. 2003; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434960; No Copyright; Avail: Defense Technical Information Center (DTIC)

In conversation, people often use spatial relationships to describe their environment, e.g., 'There is a desk in front of me and a doorway behind it', and to issue directives, e.g., 'Go around the desk and through the doorway.' In our research, we have been investigating the use of spatial relationships to establish a natural communication mechanism between people and robots, in particular, for novice users. In this paper, the work on robot spatial relationships is combined with a multi-modal robot interface. We show how linguistic spatial descriptions and other spatial information can be extracted from an evidence grid map and how this information can be used in a natural, human-robot dialog. Examples using spatial language are included for both robot-to-human feedback and also human-to-robot commands. We also discuss some linguistic consequences in the semantic representations of spatial and locative information based on this work.
DTIC
Human-Computer Interface; Natural Language (Computers); Robots

20050196148 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA
Applying Technology to Train Visualization Skills
Nanda, Sanjeeb; Jun. 2005; 73 pp.; In English
Contract(s)/Grant(s): W74V8H-04-P-0436; Proj-A790
Report No.(s): AD-A435030; ARI-CR-2005-05; No Copyright; Avail: CASI; A04, Hardcopy

Report developed under a Small Business Technology Transfer Research (STTR) program contract tor topic A04-T002. Training visualization skills, such as terrain appreciation, is generally difficult and inefficient in the real world with natural representations or in a classroom with analog representations. Field training requires physical relocation of trainees to multiple sites and is constrained by the terrain types and features at the physical sites available. Classroom training is traditionally based on analog methods with inflexible formats (e.g., graphics and pictures) that afford little control over viewing perspective, environmental conditions, or comparison with map representations. In contrast, the application of digital methods to train and enhance visualization skills may overcome many of these training limitations. This Phase I effort addressed three objectives: identify a set of key visualization skills required of warfighters, develop core technologies for training those visualization skills, and develop digital training methods based on the core technologies. In particular, the training approach dynamically varies digital terrain representations to match real world perspectives and attempts to foster cognitive engagement by providing trainees direct control over the matching process (e.g., morphing between 2-dimensional and 3-dimensional terrain perspectives).
DTIC
Pattern Recognition; Virtual Reality; Visual Perception

20050196204 Texas Univ., Austin, TX USA
Random Variate Generation for Bayesian Nonparametric Reliability Analysis
Munson, Patrick J.; May 2005; 71 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435110; No Copyright; Avail: Defense Technical Information Center (DTIC)

Simulation modeling requires accurate input analysis to ensure validity of the study. Hence, the mantra 'garbage in = garbage out.' Much of the research and simulation code that has been written to date has been focused on traditional parametric methods. Here we investigate Bayesian nonparametric methods for input modeling and reliability analysis. Bayesian nonparametric methods have been shown in many cases to produce better predictive models. Also, for use in a Bayesian setting, we have written C++ classes for random variate generation. These contain functions for standard and truncated distributions as well as functions for statistical data handling. Although we have written the code for Bayesian algorithms, the functions can be used anywhere a good source of random variates is needed. Included is a detailed description of class implementation and usage along with complete source code.
DTIC
Bayes Theorem; Computerized Simulation; Nonparametric Statistics; Random Numbers; Random Variables; Reliability Analysis; Simulation; Software Reliability

20050196244 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Extension of the Theory of Job Embeddedness: An Investigation of Effect on Intent to Turnover of USA Air Force Members
Hassell, Charles E.; Mar. 2005; 127 pp.; In English
Report No.(s): AD-A435182; AFIT/GEM/ENV/05M-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study investigated the ability of Mitchell, Holtom, Lee, Sablynski, and Erze's (2001) job embeddedness construct

to predict intent to turnover after considering the historical predictors of job satisfaction, organizational commitment, job search, and job alternatives. This study extended the research on job embeddedness by investigating the extent to which age, race, gender, and marital status would affect the relationship between job embeddedness and intent to turnover. Results indicated that job embeddedness was a significant predictor of intent to turnover. However, age, race, gender, and marital status were not found to be significant moderators of job embeddedness and intent to turnover.
DTIC
Embedding; Personnel Management; Tasks; United States

20050198897 NASA Glenn Research Center, Cleveland, OH, USA
Presumed PDF Modeling of Early Flame Propagation in Moderate to Intense Turbulence Environments
Carmen, Christina; Feikema, Douglas A.; November 18, 2003; 52 pp.; In English
Contract(s)/Grant(s): 22-101-42-02
Report No.(s): E-14446; Copyright; Avail: CASI; A04, Hardcopy

The present paper describes the results obtained from a one-dimensional time dependent numerical technique that simulates early flame propagation in a moderate to intense turbulent environment. Attention is focused on the development of a spark-ignited, premixed, lean methane/air mixture with the unsteady spherical flame propagating in homogeneous and isotropic turbulence. A Monte-Carlo particle tracking method, based upon the method of fractional steps, is utilized to simulate the phenomena represented by a probability density function (PDF) transport equation. Gaussian distributions of fluctuating velocity and fuel concentration are prescribed. Attention is focused on three primary parameters that influence the initial flame kernel growth: the detailed ignition system characteristics, the mixture composition, and the nature of the flow field. The computational results of moderate and intense isotropic turbulence suggests that flames within the distributed reaction zone are not as vulnerable, as traditionally believed, to the adverse effects of increased turbulence intensity. It is also shown that the magnitude of the flame front thickness significantly impacts the turbulent consumption flame speed. Flame conditions studied have fuel equivalence ratio s in the range phi = 0.6 to 0.9 at standard temperature and pressure.
Author
Turbulent Flames; Flame Propagation; Normal Density Functions; Time Dependence; Turbulence Effects; Flow Distribution; Ignition Systems

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20050188624 Princeton Univ., NJ USA
Coding Theory Information Theory and Radar
Calderbank, Arthur R.; Jan. 2005; 19 pp.; In English
Contract(s)/Grant(s): FA9550-04-1-9450
Report No.(s): AD-A434253; AFRL-SR-AR-TR-05-0225; No Copyright; Avail: CASI; A03, Hardcopy

This project provides a theoretical foundation for the development of algorithms to significantly expand radar functionality, given a facility capable of high levels of temporal and spatial diversity of waveforms and polarization, where the mode of operation can be rapidly scheduled. The long term aim is to exploit the diversity and flexibility provided by this advanced functionality through adaptive multidimensional waveform and polarization scheduling based on environment modeling and tracking, as well as multi-dimensional adaptive processing of the returns. In collaboration with Bill Moran (Melbourne) and Stephen Howard (DSTO, Australia) we found that the discrete Heisenberg-Weyl group provides a unifying framework for a number of important sequences significant in the construction of phase coded radar waveforms, in communications as spreading sequences, and in the theory of error correcting codes. Among the sequences which can be associated with the Heisenberg-Weyl group are the Golay or Welti sequences, which are pairs of sequences of unimodular complex numbers such that the sum of their individual auto-correlation functions forms delta spike or thumb tack.
DTIC
Coding; Game Theory; Information Theory; Radar

20050188626 Lucent Technologies, Murray Hill, NJ USA
Fundamentals of Combinatorial Optimization and Algorithm Design
Shepherd, Bruce; Winkler, Peter; Chekuri, Chandra; May 2005; 8 pp.; In English
Contract(s)/Grant(s): N00014-04-M-0042
Report No.(s): AD-A434261; 052405-03; No Copyright; Avail: CASI; A02, Hardcopy

The main activities supported under this grant are research and support for C. Chekuri, B. Shepherd and P. Winkler. Funds also supported one summer intern, Andrew McGregory from U-Penn, who worked with Shepherd on recognizing Hilbert Bases and other theoretical topics in Math Programming. Visits from scientists include a 2-week visit from Gianpaolo Oriolo (Rome), which resulted in new joint work on robust network design, a week visit from Seffi Naor (Technician) and a visit from Anreas Sebo who spoke on a new result of Bessy and Thomasse that solves an old conjecture of Gallai. Research highlights this year include: proof that in planar graphs with all capacities at least 2, the integrality gap for edge-disjoint paths is polylogarithmic (the paper was invited for the selected papers issue devoted to FOCS 2005); a first result showing the hardness of the robust network design and introduction of the single-source hose model for robust networks; and an unlikely question: is it hard to determine whether the rows of 0,1 matrix form a Hilbert Basis? Conferences attended were the 2004 APPROX/RANDOM (Chekuri), CORC 4th Optimization Day, INOC, Aussois workshop (Shepherd), and a workshop in Bertinoro, Italy (Chekuri & Shepherd).
DTIC
Algorithms; Combinatorial Analysis; Optimization

20050192592 NATO Consultation, Command, and Control Agency, Utting, Germany
An Expert System Based Approach to Analyse the Underlying Structure of a Multilateral Crisis
Nonnenmacher, Wolfgang; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 6-1 - 6-11; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The paper describes an experimental expert system approach to support the analysis of the structure of a multilateral crisis. The focus is not only put on the immediately visible contentious issues but also on the underlying concerns and grievances, which often are based on divergent political or economic interests, mutually different perceptions of intentions or actions, different culture, different value systems. The various interests, internal conflicts and goals of the key players in an area where a mission has to be carried out, may impose serious constraints/ restraints on our planning alternatives, rules of engagement and acceptable courses of action. The information we normally can access consists in most cases of a sometimes affluent quantity of unstructured bits and pieces of data, which needs to be transformed into meaningful knowledge relevant for our decisions. The approach introduced here has been designed to support this transformation process by helping to structure and formalize the available data and draw decision-relevant conclusions by applying a set of predefined, comprehensible inference - and decision rules. A prototype version of the system has been implemented in PROLOG, which is a so-called descriptive, predicate logic based language, which allows describing chains of if-then statements, applying rules recursively and even adding new rules dynamically.
Author
Expert Systems; Perception; Constraints; Predicate Logic; Inference

20050192595 Delegation Generale de l'Armement, Issy-les-Moulineaux, France
APLET (Aide a la Planification d'Engagement Tactique Terrestre): M&S in Decision Support for Course of Action Analysis, APLET
Khimeche, Lionel; deChamps, Patrick; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 4-1 - 4-21; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

APLET (acronym for 'Aide a la PLanification d'Engagement Tactique') is a French MoD R&T program which aims to investigate the capabilities offered by M&S for its integration into an existing Brigade level C4I system for Courses of Action Analysis (COAA) purposes. In addition, this program is dedicated to exploring the technical issues of C4I-M&S coupling and to providing recommendations for M&S interfaces, models and data models to overcome the gap between current M&S and legacy C4I. A series of demonstrators is developed to prove the feasibility and demonstrate the technical approaches studied and recommended for future use. This paper first introduces the main COAA operational requirements derived from the French Military Decision-Making Process used at tactical level and called MEDO (Methode d'Elaboration d'une Decision Operationnelle). Regarding user needs, the second part highlights the works led to improve the interoperability between future simulation and C4I system. It presents the major amendments of the Command and Control Information Exchange Data Model

(C2IEDM) to be consistent with simulation models requirements and C4I-M&S interchange mechanisms based on XML. In a third part, this paper addresses the definition and development of physical and behavior models for Armed forces units based on Reaction Diffusion Equations (RDE). It explains how such algorithms are optimized and customized to move closer to ground truth. The last part deals with the lack or rarity of military expertise that forced, until the latest time, the postponement of the development of Command and Control (C2) models. Overcoming such drawbacks, the technical software architecture designed for APLET is introduced. The paper then focuses on APLET's capabilities for C2 model creation considering such models as UML finite state machines. This program is a part of different works on C4I-M&S interoperability led by the French MoD. A short-term objective is to obtain an operational interoperability between legacy C4I and simulation systems that meets the major Military requirements. Thus, alignment of C4I and simulation data models based on C2IEDM is seen as mandatory. A mid-term objective is to share common components between C4I and M&S in order to improve interoperability and then to extend Military use of simulation on the battlefield. The long-term objective is to reach the alignment of architectures, for embedding simulation into C4I thus covering the full spectrum of operational requirements. In that frame, cooperation is envisioned within SISO C4ISR-Simulation Product Development Group (PDG) and the DMSO Program on Extended Battle Management Language (XBML). In order to improve the C4I-M&S interoperability, the authors recommend the creation of an NMSG Technical Activity based on the alignment of C4I and simulation data models and the definition of a common dictionary. The common sharing of results of the French studies, APLET for instance, UK and US works on BML, Battle Management Language, could facilitate to start such technical Activity.
Author
Project Management; Decision Making; Command and Control; Armed Forces; SISo (Control Systems); Systems Analysis

20050192606 Army Communications-Electronics Command, Fort Monmouth, NJ, USA
Systems Interoperability Simulation Environment (SISE)
Pei, Richard; Nordenberg, Rickard; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 9-1 9-6; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The US Army Communications-Electronics Research, Development & Engineering Center, Intelligence and Information Warfare Directorate has an on-going cooperative Project Agreement with the Swedish Armed Forces Defense Materiel Administration (FMV) that is aimed at the development and application of advanced modeling and simulation (M&S) environment and tools to support research & development of technology covering Communications, Command, Control, Computer, Intelligence (C4I) Sensor and Survivability. The current efforts of the US-Sweden cooperative project is focused on leveraging M&S technology and capabilities from both nations and incorporates the Coalition Interoperability through standards-based Simulation Environments (CISE) products and /High Level Architecture (HLA) standards to support priority C4ISR M&S and analysis tasks (e.g. scenario-based simulations using virtual environments and hardware-in-the-loop). The technical objective is to develop an US-Sweden (SE) M&S architecture with necessary tools, known as the Systems Interoperability Simulation Environment (SISE). The SISE has been designed based on the IEEE 1516 HLA standard and is being implemented in a highly flexible and scalable architecture such that it can be easily adapted for use by other coalition/allied nations to conduct Systems-of-Systems level studies and analysis in applications related to interoperability and other coalition operational issues. The core SISE capability will be demonstrated in November 2004 through use case simulations in Network-Centric Warfare and Coalition Combat Identification.
Author
Command and Control; Computerized Simulation; Communication Equipment; Interoperability; Systems Simulation; Armed Forces

20050193452 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The APPL 'Learning Map'
ASK Magazine; No. 21; Spring 2005, pp. 31-32; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Root Learning, a learning consulting organization with a background in strategic planning, recognizes the knowledge gap that frequently exists between a leadership team and the rest of an organization. Team members supposedly working toward the same goal don't always have the same vision as to where the organization is headed, and they may not understand how the piece they are accountable for fits into the big picture. To address these complex problems, Root Learning utilizes the age-old tools of sarcasm, metaphor and graphics (much in the same way that ASK uses a traditional storytelling format.) The company is best known for creating 'Learning Maps' like this one: humorous drawings based on the inner workings of an organization. Their purpose is to put complex topics on the table, to stimulate discussion, and to ultimately give team members

a common vision of where the organization is going and what role they personally play in getting there. APPL knows how effective it is to incorporate new and engaging techniques into its knowledge sharing programs. By collaborating with Root Learning, we were able to expand the knowledge of the organization and add one more of these techniques to our repertoire. Derived from text

Management Planning; Project Management; Organizations; Education

20050196081 Navy Center for Applied Research in Artificial Intelligence, Washington, DC USA

Goal Tracking and Goal Attainment: A Natural Language Means of Achieving Adjustable Autonomy

Perzanowski, Dennis; Schultz, Alan C.; Marsh, Elaine; Adams, William; Jan. 1999; 7 pp.; In English

Report No.(s): AD-A434931; No Copyright; Avail: Defense Technical Information Center (DTIC)

Intelligent mobile robots that interact with humans must be able to exhibit adjustable autonomy, that is the ability to dynamically adjust the level of autonomy of an agent depending on the situation. When intelligent robots require close interactions with humans, they will require modes of communication that enhance the ability for humans to communicate naturally and that allow greater interaction. Our previous work examined the use of multiple modes of communication, specifically natural language and gestures, to disambiguate the communication between a human and a robot. In this paper, we propose using context predicates to keep track of various goals during human-robot interactions. These context predicates allow the robot to maintain multiple goals, each with possibly different levels of required autonomy. They permit direct human interruption of the robot, while allowing the robot to smoothly return to a high level of autonomy.

DTIC

Adjusting; Artificial Intelligence; Autonomy; Natural Language (Computers); Robots

20050196186 Stanford Univ., Stanford, CA USA

Next Generation Software Development

Manna, Zohar; Jan. 2005; 18 pp.; In English

Contract(s)/Grant(s): DAAD-19-01-1-0723

Report No.(s): AD-A435087; ARO-41923.1-CL; No Copyright; Avail: CASI; A03, Hardcopy

Under this grant we have studied the development of a scientifically sound basis for software development that builds on widely used pragmatic methods but is firmly grounded in well-established formal domains such as first- order logic and automata theory. To be sufficiently expressive for software systems, the work has focused on methods applicable to infinite-state systems. Traditionally methods for infinite-state systems have been expensive, because they were mainly deductive and thus required guidance by users who were both experts in the application domain and in the verification methodology. Our research has been directed at algorithmic-deductive techniques that separate the combinatorial reasoning from reasoning about the data. These methods often limit user input to providing abstract system models and application-level guidance, making the interaction more natural to software developers. Constructed proofs hide low-level details; instead, they reason at the most appropriate level of abstraction with respect to the properties to be proved. This characteristic of proofs make them suitable as system documentation that can evolve with the system. To ensure well-defined semantics, computational models were developed for new computing paradigms, including aspects of publish-subscribe systems and middleware design patterns.

DTIC

Computer Programming; Software Engineering

20050196189 Air Force Academy, CO USA

Violent Systems: Defeating Terrorists, Insurgents, and Other Non-State Adversaries

Thomas, Troy S.; Casebeer, William D.; Mar. 2004; 113 pp.; In English; Original contains color illustrations

Report No.(s): AD-A435091; No Copyright; Avail: Defense Technical Information Center (DTIC)

This is the 52nd volume in the Occasional Paper series of the U.S. Air Force Institute for National Security Studies (INSS). This paper continues the work begun by Troy Thomas and Stephen Kiser in 'Lords of the Silk Route: Violent Non-State Actors in Central Asia' (INSS Occasional Paper 43, May 2002). Inter-state war no longer dominates the landscape of modern conflict. Rather, collective violence and challenges to the international system come increasingly from violent non-state actors (VNSA). With few exceptions, VNSA play a prominent, often destabilizing role in nearly every humanitarian and political crisis faced by the international community. The broad spectrum of objectives and asymmetric methods of these contemporary Barbary Pirates fractures traditional conceptions of deterrence and warfighting. The authors contend that deterrence remains a viable strategy for meeting their challenge if adapted to an understanding of VNSA as dynamic biological

systems. The prolonged utility of deterrence hinges on insight into VNSA life cycles and a broader conception of the psychology inherent in organizational decision making. Bundled as 'broad biological deterrence' (BBD), they develop deterrent strategies that tackle the VNSA threat throughout its life cycle. However, the authors also realize that deterrence may not work in every case. This sets up a counter-VNSA (C-VNSA) strategy that goes beyond coercion to the defeat of the enemy. At its core, their C-VNSA strategy defeats a VNSA by the following: (1) denying the negative entropy, or stores of energy, required to survive attack; and (2) disrupting congruence, or fit, among sub-systems to achieve system failure. By also understanding the indicators of organizational change during its developmental life cycle, preemptory defeat before the VNSA reaches maturity becomes feasible. Their approach allows for measuring campaign progress by assessing changes in VNSA effectiveness.
DTIC
Systems Analysis; Warfare

20050196237 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Effects-Based Decision Making in the War on Terror
Umstead, Robert K.; Jun. 2005; 73 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435165; AFIT/GOS/ENS/05-15; No Copyright; Avail: Defense Technical Information Center (DTIC)

In recent years, effects-based planning, execution, and assessment has moved from doctrinal debate to operational implementation in the U.S. military. Although effects-based operations (EBO) implementation strategies vary among the combatant commands and services, each faces the difficult task of planning and assessing their operations. USPACOM, the sponsor of this research, faces these challenges on a daily basis as they fight the war on terror in their area of responsibility. From an operations research (OR) prospective, EBO formulations resemble networks with structures ranging from hierarchical (objective-effect-action-resource chains) to closed (systems-of-systems nodal chains). Many traditional OR network techniques can be employed to analysis these formulations. This project investigates two such techniques, network flows and risk analysis to identify nodes of influence (centers of gravity) and courses of actions (sets of actions). Applications of these techniques span the entire spectrum of military operations, but are particularly suited to the war on terrorism.
DTIC
Decision Making; Military Operations; Network Analysis; Risk; Terrorism; Warfare

20050196247 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Decision Analysis Using Value-Focused Thinking for Infrastructure Prioritization
Tenorio, Mona A.; Mar. 2005; 114 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435188; AFIT/GEM/ENV/05M-12; No Copyright; Avail: Defense Technical Information Center (DTIC)

Infrastructure systems and facilities have deteriorated due to the impact of limited defense funding and competing priorities within the Air Force. The current method used for infrastructure prioritization is influenced by political sensitivity and uncertainty regarding the consequences of various funding decisions. Senior leaders need to better understand how their funding decisions will impact the overall condition and service life of the installation's infrastructure systems and facilities. The purpose of this research was to improve the method of prioritizing infrastructure projects through the use of a decision analysis methodology known as Value-Focused Thinking. The value model was created based on the perspective of the civil engineer with inputs from a proxy decision maker at Headquarters Air Force Materiel Command. The model was used to apply three funding strategies to develop prioritized lists of restoration and modernization projects. It also applies metrics to compare the three funding strategies and their impact to the installation's infrastructure. The resulting model provides insight to the decision maker on which funding strategy is best suited for prioritizing infrastructure projects and how their selection of prioritized projects will impact the overall condition and service life of infrastructure systems and facilities.
DTIC
Decision Making; Decision Theory

20050196265 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Strategies for Human-Automaton Resource Entity Deployment (SHARED)
Cruz, Jose B., Jr; Dec. 2003; 109 pp.; In English
Contract(s)/Grant(s): F33615-01-C-3151; Proj-A055
Report No.(s): AD-A435225; AFRL-VA-WP-TR-2005-3048; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report documents work done with DARPA funding, under contract F33615-01-C-3151 for the period of performance

of September 2001 through December 2003. The main goal of the SHARED project is to develop a methodology for hierarchical control, including theory, algorithms, and experimentations. The goal also is to demonstrate the methodology in a prototype tool for optimal planning of shared responsibilities and roles in the hierarchical deployment and operation of teams of distributed cooperative automaton entities and human operators in future combat systems, in adversarial and uncertain situations. The underlying theme of the SHARED project is the use a hierarchical game theoretic framework, where entities at different levels use leader-follower games, peer entities at the same level use principles of cooperative games, robustness and estimation theory are blended, and total system design is human-centered.
DTIC
Deployment; Game Theory; Human Resources

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20050188551 Texas Univ., Austin, TX USA
A Group Theoretic Approach to Metaheuristic Local Search for Partitioning Problems
Kinney Jr, Gary W.; May 2005; 123 pp.; In English
Report No.(s): AD-A432696; CI04-1045; No Copyright; Avail: CASI; A06, Hardcopy

Recent work has demonstrated the power of combining group theory with metaheuristic search methodologies to solve discrete optimization problems. Group theory provides tools to characterize the underlying structures in move neighborhoods, solution representations and solution landscapes. Exploiting these structures with group theoretic techniques produces highly effective and efficient search algorithms. Discrete optimization problems may be divided into three distinct groups: partitioning, ordering and partitioning-and-ordering problems. Partitioning problems such as set covering, knapsack and min-cut network flow problems have no ordering context and require only that the solution variables be placed into mutually exclusive sets. Ordering problems such as single-agent traveling salesman, single-machine job shop scheduling and single-vehicle routing problems require that a permutation of the solution variables be stipulated. Partitioning-and-ordering problems such as multiple-agent traveling salesmen, multiple-machine job shop scheduling and multiple-vehicle routing problems require that the solution variables be partitioned and ordered within each partition.
DTIC
Discrete Functions; Probability Distribution Functions

20050188554 Sintef Applied Mathematics, Oslo, Norway
Lie Group Techniques for Neural Learning
Celledoni, Elena; Jan. 2005; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A433732; No Copyright; Avail: CASI; A03, Hardcopy

OUTLINE: 1. Neural Networks: a short introduction; 2. Independent Component Analysis: (a) Stochastic signal processing; (b) Constraint optimization in ICA; 3. Geometric Integration of Learning Equations: (a) Gradient flows and algorithms on manifolds; (b) MEC learning; (c) Newton methods; (d) Diffusion algorithms.
DTIC
Lie Groups; Machine Learning; Neural Nets; Neurophysiology; Pattern Recognition

20050188633 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Development of a Higher-Order Upwind Algorithm for Discontinuous Compressible Flow
Croker, Barry A.; Mar. 2005; 98 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434268; AFIT/GAE/ENY/05-M05; No Copyright; Avail: CASI; A05, Hardcopy

A global fourth-order solution method that incorporates compact differencing with Roe's approximate Riemann solver was investigated. This method was incorporated into a one-dimensional numerical simulation of the compressible Euler equations, and applied to a one-dimensional shock tube problem. The method was also extended to two dimensions, and applied to a two-dimensional shock tube problem and an advecting vortical structure problem on both rectilinear and curvilinear meshes. The results were compared to a third-order Roe scheme and a fourth-order compact difference scheme. An order of accuracy determination showed that it has an order of accuracy somewhere near fourth order, with absolute error comparable to that of the standard compact difference scheme. With proper selection of solution parameters, the scheme was

also shown to accurately capture a discontinuous solution where unfiltered compact schemes would become unstable.
DTIC
Algorithms; Compressible Flow; Difference Equations

20050188640 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Non-Adiabatic Energy Surfaces of the B+H2 Systems
Belcher, Lachlan T.; Mar. 2005; 78 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434277; AFIT/GAP/ENP/05-01; No Copyright; Avail: CASI; A05, Hardcopy

In order to solve the dynamics of a system, the kinetic energy operator of the Hamiltonian must be diagonalized. Diagonalization requires rotation of the system into a non-adiabatic representation. This rotation is a coupling angle determined by the derivative coupling terms. Derivative coupling terms are calculated using Columbus and Brooklyn, software packages. Separation of internal dynamics characterized by Jacobi coordinates, and external dynamics characterized by a set of Euler angles and the center of mass position, requires a transformation from Cartesian coordinates to Jacobi coordinates required for subsequent dynamical calculations. Previous attempts to solve for non-adiabatic energy surfaces in this manner have failed because of an ambiguity in selecting the correct variable for describing the overall rotation of the B+H2 system, giving answers that do not agree with theory. This error, which lies within the method of converting from one coordinate system to another, is discovered and corrected. By way of this correction, correct coupling angles are calculated, and non-adiabatic energy surfaces are calculated.
DTIC
Adiabatic Conditions; Hamiltonian Functions; Quantum Chemistry

20050188693 South Carolina Univ., Columbia, SC USA
Cyberspace Assurance Metrics: Utilizing Models of Networks, Complex Systems Theory, Multidimensional Wavelet Analysis, and Generalized Entrophy Measures
Johnson, Joseph E.; Gudkov, Vladimir; Apr. 2005; 89 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-02-1-0231; Proj-PO91
Report No.(s): AD-A434351; AFRL-IF-RS-TR-2005-141; No Copyright; Avail: CASI; A05, Hardcopy

The problem is addressed of developing a very general mathematical foundation for networks that permits practical application in the monitoring of large networks such as the internet for both known and unknown attacks, intrusions, worms, viruses, and generally for destructive agents and processes. The PI, under the funding of this grant, has discovered a strong connection between the topological specification of a network in the form of a connection matrix and the branches of mathematics known as continuous group theory and Markov processes. Based upon this research he has proposed that entropy metrics, and the associated cluster analysis of the network so measured by these metrics, can be useful indicators of aberrant processes and behavior. Other team members have obtained important connections using higher order Renyi entropy metrics, and complexity theory to both monitor real networks and to study networks by simulation.
DTIC
Complex Systems; Security; Systems Analysis; Topology; Wavelet Analysis

20050188810 Defence Science and Technology Organisation, Salisbury, Australia
Approximate Invariance of the Inverse of the Covariance Matrix and the Resultant Pre-Built STAP Processor
Dong, Yunhan; Mar. 2005; 78 pp.; In English
Report No.(s): AD-A434589; DSTO-RR-0291; DODA-AR-013-364; No Copyright; Avail: Defense Technical Information Center (DTIC)

Space-time adaptive processing (STAP) has been proven to be optimum in scenarios where an airborne phased-array radar is used to search for moving targets. The STAP requires the inverse of the covariance matrix (ICM) of undesired signals. The computation of the real-time ICM is impractical at current computer speeds. Proposing two Theorems, this report indicates that the ICM is approximately invariant if radar and platform parameters remain unchanged. A pre-built STAP (PSTAP) processor is then proposed. Both the simulated data from a generic airborne phased array radar model and real data collected by the multi-channel airborne radar measurement (MCARM) system are processed to verify the processor. Results indicate that the performance of the proposed PSTAP processor is the same as that of the real-time STAP processor.
DTIC
Covariance; Data Processing; Invariance; Matrices (Mathematics); Signal Processing

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics*, or *92 Solar Physics*.

20050188559 Technische Hogeschool, Delft, Netherlands
Open Hole Multilayer Fatigue Crack Growth in Glare Under Combined Tension Bending
Randell, Christian E.; Schijve, Jaap; van der Zwaag, Sybrand; May 2005; 13 pp.; In English
Report No.(s): AD-A433899; CI04-1092; No Copyright; Avail: CASI; A03, Hardcopy

This paper involves the development of an analytical/numerical crack growth model to predict surface and subsurface fatigue crack growth in the fibre metal laminate (FML) Glare subjected to combined tension and bending. The stress intensity factor for Glare can be divided into two parts: the stress intensity due to the crack opening stresses, and the stress intensity due to the fibre bridging stresses. The first component is derived from a stress intensity formulation for specimen geometry of monolithic aluminum. The second component is dependent upon the shape of the delamination surrounding the crack and the stresses in the fibres. Delamination shapes were taken from experimental observations, and fibre-bridging stresses were extracted from FEM. Using this approach, predictions are made on crack growth in the Glare surface layer and sub-surface layers. A new milled open-hole tension bending (MOHTB) fatigue specimen was developed to induce combined tension and bending in Glare specimens. This configuration avoids plastic deformations and spurious fatigue cracking observed in standard open-hole tension bending specimens. Fatigue tests were carried out on Glare 2A-5/4-0.4 and Glare 2A-6/5-0.4 specimens. Data on the crack initiation periods in each of the layers are also presented. The comparison between the predicted fatigue crack growth in the aluminum layers and the experimental observations indicated a good agreement both for shape and scale of the crack growth curves.
DTIC
Bending; Bending Fatigue; Crack Propagation; Fatigue (Materials); Glare; Holes (Mechanics); Interfacial Tension; Prediction Analysis Techniques

20050188799 California Univ., Santa Barbara, CA USA
Manipulation and Control of Nanometer-Scale Magnetism for Multifunctional Information Processing
Awschalom, David D.; Jan. 2004; 7 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0038; Proj-2305
Report No.(s): AD-A434567; AFRL-SR-AR-TR-05-0194; No Copyright; Avail: CASI; A02, Hardcopy

RESEARCH TOPICS: 1. Spontaneous Spin Polarization in Hybrid FM/ semiconductor Structures; 2. Ferromagnetic Imprinting of Nuclear Spins in Semiconductors; 3. Spatial Imaging of Magnetically Patterned Nuclear Spins in GaAs Devices; 4. Voltage Control of Nuclear Spin in Ferromagnetic Schottky Diodes; 5. Giant Planar Hall Effect in (Ga,Mn)As Lateral Devices; 6. Highly Enhanced Curie Temperature in (Ga,Mn)As Epilayers.
DTIC
Data Processing; Ferromagnetism; Magnetic Properties; Nuclear Spin; Particle Spin; Quantum Numbers; Semiconductors (Materials)

20050188800 New Jersey Inst. of Tech., Newark, NJ USA
Numerical Modelling of Electromagnetic Wave Propagation and Scattering: High-Order Schemes, Impedance Boundary Conditions and Cole-Cole Dielectrics
Petropoulos, Peter G.; Sep. 2004; 19 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0031
Report No.(s): AD-A434568; AFRL-SR-AR-TR-05-0231; No Copyright; Avail: CASI; A03, Hardcopy

Paper #1 was listed in the report for Grant F49620-99-1-0072 as 'to appear' and the work presented there was described previously. In paper #2 we presented an analysis of the perfectly matched layer in cylindrical coordinates discretized with a staggered second-order accurate finite difference time domain method. In paper #3 we conclusively addressed the long-standing issue of the long-time stability of the unsplit Perfectly Matched Layer. In paper #4 we examine the short- and long-time response of a Cole-Cole dielectric half-space subjected to a delta-function incident pulse. We find that the Cole-Cole

impulse response is infinitely smooth at the wavefront (short-time) in contrast to the case of the Debye impulse response that is discontinuous at the wavefront.
DTIC
Boundary Conditions; Boundary Layers; Dielectrics; Electrical Impedance; Electromagnetic Wave Transmission; Impedance; Mathematical Models; Numerical Analysis

20050188822 Naval Undersea Warfare Center, Newport, RI USA
Dynamic Response of a Fluid-Loaded Plate Containing Periodic Masses
Hull, Andrew J.; Mar. 2005; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434617; NUWC-NPT-TR-11662; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report derives the equations of motion of a fluid-loaded thin plate that contains periodically spaced embedded masses and is insonified by a harmonic plane wave. The thin plate equations of motion are coupled to the fluid and to the embedded masses and analyzed to determine the displacement field in the wave number-frequency domain. The masses of the periodic discontinuities are then varied to study their influence on the system dynamics. The formulation is then expanded to Timoshenko-Mindlin equations of motion, so that additional plate dynamics can be exhibited and understood. The problem is then posed using thick plate theory and the finite-element method to generate numerical solutions. Finally, thick plate equations of motion that contain bottom attached masses are formulated and presented.
DTIC
Dynamic Response; Fluid Dynamics

20050194609 Bari Univ., Italy, Continuous Electron Beam Accelerator Facility, Newport New, VA, USA, Florida International Univ., Miami, FL, USA
Hypernuclear Physics at Jefferson Lab
Iodice, M.; Cisgani, E.; Frullani, S.; Garigaldi, F.; Iommi, R.; January 2005; 16 pp.; In English
Report No.(s): DE2005-837261; No Copyright; Avail: Department of Energy Information Bridge
The Continuous Electron Beam Accelerator Facility (CEBAF) has been successfully carrying out hadronic physics studies since 1996 at the Thomas Jefferson National Accelerator Facility (JLab) in Virginia, USA. The characteristics of this electron beam, together with those of the experimental equipment, offer a unique opportunity to study the electro-production of hypernuclei through the reaction A(e,e(prime)K(sup +))B(sub (Lambda)), where the hypernuclear production is tagged by the detection of the scattered electron in coincidence with the produced kaon. The kaon is a part of the associated strangeness pair production with a (Lambda) hyperon remaining embedded in the nuclear medium to form the hypernucleus. The hypernuclear physics program will cover an important part of the JLab experimental program over the next few years. This short review will focus mainly on a few subjects, and some experimental details of the Hall A experiment, where the authors have primarily responsibilities, will be presented.
NTIS
Hypernuclei; Linear Accelerators; Pair Production

20050194614 Sheffield Univ., UK
Development of a Liquid Metal Based Fuel Gas Scrubbing System
January 2005; 20 pp.; In English
Report No.(s): DE2005-836764; No Copyright; Avail: Department of Energy Information Bridge
The objective of this research project is to perform studies on an analogous room temperature packed bed scrubber operating under non-wetting conditions, providing insight and understanding towards the development of a high temperature packed bed gas scrubber irrigated by molten tin.
NTIS
Cycles; Fuel Systems; Gasification; Liquid Metals; Metal Fuels; Metal Propellants; Scrubbers; Washing

20050194618 Lawrence Livermore National Lab., Livermore, CA USA
Prospects for High-Gain, High Yield NIF Targets Driven by 2w (green) Light
Suter, L. J.; Glenzer, S.; Haan, S.; Hammel, B.; Manes, K.; Sep. 2003; 30 pp.; In English
Report No.(s): DE2005-15013792; UCRL-CONF-200817; No Copyright; Avail: Department of Energy Information Bridge
For several years we have been exploring the possibility of using green (2w) light for indirect drive ignition on NIF. The rationale for this work is the possibility of extracting significantly more energy from NIF in green light, as compared to blue

(3w) light, and driving far more energetic capsules than we originally envisioned when we started planning NIF in the early 1990's. This paper attempts to provide a comprehensive picture of the progress we have made exploring 2w for NIF ignition. First we describe the potential operating regime for NIF at 2w and how that can translate into a very large 'design space' for exploring ignition target designs. We then present the results of 2w ignition target design studies indicating that we can achieving adequate drive and symmetry with 2w and showing how we might capitalize on the large amount of energy available by electing to trade-off coupling efficiency for, say, better symmetry or plasma conditions. These simulations also define plasma conditions for ignition-relevant 2w laser-plasma interaction experiments that have been recently performed. We summarize the results of these experiments which indicate that 2w LPI is not very different from 3w's. Finally, we show how recent experimental findings on mitigating 2w laser plasma interactions through reduced intensity and/or judicious choice of plasma composition can be incorporated into ignition target designs.
NTIS
High Gain; Ignition; Targets

20050194619 Lawrence Livermore National Lab., Livermore, CA, USA
Probability Density Function for Waves Propagating in a Straight Rough Wall Tunnel
Pao, H.; Jan. 30, 2004; 10 pp.; In English
Report No.(s): DE2005-15013903; UCRL-PROC-202082; No Copyright; Avail: Department of Energy Information Bridge
The radio channel places fundamental limitations on the performance of wireless communication systems in tunnels and caves. The transmission path between the transmitter and receiver can vary from a simple direct line of sight to one that is severely obstructed by rough walls and corners. Unlike wired channels that are stationary and predictable, radio channels can be extremely random and difficult to analyze. In fact, modeling the radio channel has historically been one of the more challenging parts of any radio system design; this is often done using statistical methods.
NTIS
Electromagnetic Wave Transmission; Probability Theory; Radio Transmission; Walls; Probability Density Functions; Wave Propagation

20050194621 Connecticut Univ., Storrs, CT, USA
Fundamental Interactions in Nuclei
Ramsey-Musolf, M. J.; Mar. 2003; 12 pp.; In English
Report No.(s): DE2005-821088; No Copyright; Avail: Department of Energy Information Bridge
The research supported by this grant was carried out in four areas: (a) physics beyond the Standard Model (SM) (b) fundamental symmetries (c) the interpretation of precision electroweak measurements (d) topics in hadron structure. The primary projects which are the results of the research supported under this grant, are summarized in this document.
NTIS
Nuclear Interactions; Standard Model (Particle Physics)

20050194622 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Southeastern Univ. Research Association, Newport News, VA, USA
Design and Evolution of Jefferson Lab's Jasmine Mass Storage System
Hess, B. K.; Haddox-Schatz, M.; Kowalski, M. A.; January 2005; 16 pp.; In English
Report No.(s): DE2005-835637; No Copyright; Avail: Department of Energy Information Bridge
We describe the Jasmine mass storage system, in operation since 2001. Jasmine has scaled to meet the challenges of grid applications, petabyte class storage, and hundreds of MB/sec throughput using commodity hardware, Java technologies, and a small but focused development team. The evolution of the integrated disk cache system, which provides a managed online subset of the tape contents, is examined in detail. We describe how the storage system has grown to meet the special needs of the batch farm, grid clients, and new performance demands.
NTIS
Computer Storage Devices; Data Storage; Linear Accelerators

20050194632 Wayne State Univ., Detroit, MI, USA
Quantum Theory of Fields
Gupta, S. N.; Sep. 1996; 12 pp.; In English
Report No.(s): DE2005-823805; No Copyright; Avail: Department of Energy Information Bridge

During the period covered by this progress report, they have published the following three research papers: (1) B(sub c) spectroscopy in a quantum-chromodynamics potential model; (2) Gauge-boson scattering signals at the CERN LHC; and (3) Relativistic two-photon and two-gluon decay rates of heavy quarkonia.
NTIS
Quantum Theory; Quantum Chromodynamics; Spectroscopy

20050194635 Southern Univ., Baton Rouge, LA, USA
Installation of a Synchrotron Radiation Beamline Facility at the J. Bennett Johnston, Sr. Center for Advanced Microstructures and Devices for the Science and Engineering Alliance
Gooden, R.; Mar. 31, 2000; 14 pp.; In English
Report No.(s): DE2005-823323; No Copyright; Avail: Department of Energy Information Bridge

The Johnston Center presents a unique opportunity for scientists and engineers at southern institutions to initiate and carry out original research using synchrotron radiation ranging from visible light to hard x-rays. The Science and Engineering Alliance proposes to carry out a comprehensive new synchrotron radiation research initiative at CAMD in carefully phased steps of increasing risks. (1) materials research on existing CAMD beam lines and end stations; (2) design, construction and installation of end stations on existing CAMD beam lines, and research with this new instrumentation; (3) design, construction and operation of dedicated synchrotron radiation beam lines that covers the full spectral range of the CAMD storage ring and expanded research in the new facility.
NTIS
Installing; Microstructure; Synchrotron Radiation

20050194637 Argonne National Lab., IL USA
Argonne National Laboratory Institutional Plan FY 2004 - FY 2008
Oct. 2003; 178 pp.; In English
Report No.(s): DE2005-823335; No Copyright; Avail: Department of Energy Information Bridge

Argonne's mission is to serve DOE and national security by advancing the frontiers of knowledge, by creating and operating forefront scientific user facilities, and by providing innovative and effective approaches and solutions to energy, environmental, and security challenges to national and global well-being, in the near and long term, as a contributing member of the DOE laboratory system. We contribute significantly to DOE's mission in science, energy resources, environmental stewardship, and national security, with lead roles in the areas of science, operation of scientific facilities, and energy. In accomplishing our mission, we partner with DOE, other federal laboratories and agencies, the academic community, and the private sector. Argonne is pursuing ten visionary strategic goals to deliver extraordinary science and technology with significant value to the nation: (1) Develop the technologies and infrastructure needed to produce, store, and distribute hydrogen fuel. (2) Close the nuclear fuel cycle, reducing the cost of nuclear waste disposal by billions of dollars and disposing of weapons-grade plutonium and actinides. (3) Develop advanced nuclear power technologies that are safe, economical, proliferation-resistant, and environmentally sustainable. (4) Plan, design, construct, and operate the Rare Isotope Accelerator (RIA) and make fundamental discoveries in nuclear physics and astrophysics. (5) Construct and operate the Center for Nanoscale Materials and create innovative materials with valuable commercial properties. (6) Lead the Genomes to Life team that focuses on protein production and related proteomics; implement computational biology to build fundamental understanding of living systems. (7) Realize the full potential of scientific simulation to solve mission-related problems, through leading-edge research on systems architecture and software, parallel programming and numerical tools, distributed computing, and computational science applications. (8) Establish a new associate laboratory directorate in national security to deliver technologies and analyses for the Department of Homeland Security, the Department of Defense, and the U.S. intelligence community. (9) Make major contributions to environmental research, taking full advantage of our state-of-the-art facilities and tools. (10) Optimize the operation of our national user facilities to perform research in fundamental science and other areas.
NTIS
Research Facilities; Management Planning; Research and Development; Nuclear Physics; Waste Disposal

20050194641 Lawrence Livermore National Lab., Livermore, CA USA
Calibration of NIF Neutron Detectors in the Energy Region E less than 14 MeV
Schmid, G. J.; Koch, J. A.; Moran, M. J.; Phillips, T. W.; Glebov, V. Y.; Apr. 16, 2004; 18 pp.; In English
Report No.(s): DE2005-15013910; UCRL-CONF-203575; No Copyright; Avail: Department of Energy Information Bridge

We examine various options for calibration of NIF neutron detectors in the energy region E less than 14 MeV. These options include: downscatter of D-T fusion neutrons using plastic targets; nuclear reactions at a Tandem Van de Graaf accelerator; and white neutrons from a pulsed spallation source. As an example of the spallation option, we present some calibration data that was recently obtained with a single crystal CVD diamond detector at the Weapons Neutron Research facility (WNR) at LANL.
NTIS
Calibrating; Ignition; Neutron Counters; Electron Accelerators

20050194644 Toledo Univ., OH, USA, Albion Coll., MI, USA
Apparatus for the Study of Electron Detachment Processes in Negative Ion - Atom and Molecule Collisions
Kvale, T. J.; Seely, D. G.; January 2005; 20 pp.; In English
Report No.(s): DE2005-834034; No Copyright; Avail: Department of Energy Information Bridge
This paper summarizes the main features of an apparatus constructed at the University of Toledo for the study of various scattering processes in intermediate energy, ion - atom collisions. The main purpose of this facility is to provide experimental data which serve as benchmarks to test current scattering theories for those processes. Recent measurements of single electron detachment (SED) and double electron detachment (DED) total cross sections for 5-50 keV H(sup -) ions incident on noble gases and for 10-50 keV H(sup -) ions incident on CH(sub 4) molecules were conducted in this laboratory. As a result of an analysis of the scattered beam growth curves, information about other charge-changing cross sections in the hydrogen-atom (molecule) collision systems were obtain, as well.
NTIS
Detachment; Ionic Collisions; Hydrogen Atoms; Molecules; Negative Ions

20050194645 Spire Corp., Bedford, MA, USA
Compact Gamma-Ray Imager for In-Vivo Gene Imaging. Final Report, September 14, 1999-March 4, 2000
Greenwald, A. C.; January 2000; 22 pp.; In English
Report No.(s): DE2005-833940; FR-60425; No Copyright; Avail: Department of Energy Information Bridge
A compact, low-cost, gamma-ray imaging system is needed to study gene expression in small animals. State-of-the-art electronic imaging systems have insufficient resolution and animals must be sacrificed for detailed imaging that precludes time evolution studies. With improved electronics radioactive tracers attached to gene markers can be used to track the absorption and mobility of gene therapy medications in live animals. Other instrumentation being developed for medical applications does not have the response to match the radiation source for this work. The objective of this research was to develop thick film (Cd,Zn)Te detectors matched to the gamma ray energy of I-129. The detector would be a direct readout device using p-i-n diodes formed from the high Z material absorbing the radiation, with separate readout. Higher quality semiconducting material was expected from epitaxial growth on GaAs, a near lattice matched substrate. In practice, it was difficult to obtain material with high resistance and low leakage current. Spire Corporation achieved the goal of fabricating working detectors in (Cd,Zn)Te deposited on GaAs. The spectra of an alpha emitter (Am-225) was adequately resolved in thin film devices. Thick p-i-n diodes were fabricated but other processing problems prevented full demonstration of a gamma ray detector.
NTIS
Gamma Rays; Genes; Imaging Techniques; In Vivo Methods and Tests

20050194651 Lawrence Livermore National Lab., Livermore, CA USA
Calculation of Phonon Density of States for Alpha-U
Kutepov, A. L.; Apr. 16, 2004; 16 pp.; In English
Report No.(s): DE2005-15014056; UCRL-TR-203559; No Copyright; Avail: Department of Energy Information Bridge
Phonon density of states for Alpha-U was calculated with the linear response theory and the RSPFLAPW (fully relativistic full potential spin-polarized linearized-augmented-plane-wave) method. It has been used for studying the temperature dependance of the specific heat of uranium. It was shown that the details of the phonon density of states (DOS) are not very important for the specific heat, and practically the same results can be obtained with Debye model.
NTIS
Phonons; Computation; Density (Mass/Volume)

20050194676 Lawrence Livermore National Lab., Livermore, CA USA
Nondipole Effects in Xe 4d Photoemission
Hemmers, O.; Guillemin, R.; Wolska, A.; Lindle, D. W.; Rolles, D.; Jul. 14, 2004; 10 pp.; In English
Report No.(s): DE2005-15014482; UCRL-PROC-205249; No Copyright; Avail: Department of Energy Information Bridge

We measured the nondipole parameters for the spin-orbit doublets Xe 4d(5)/(2) and Xe 4d(3)/(2) over a photon-energy range from 100 eV to 250 eV at beamline 8.0.1.3 of the Advanced Light Source at the Lawrence Berkeley National Laboratory. Significant nondipole effects are found at relatively low energies as a result of Cooper minima in dipole channels and interchannel coupling in quadrupole channels. Most importantly, sharp disagreement between experiment and theory, when otherwise excellent agreement was expected, has provided the first evidence of satellite two-electron quadrupole photoionization transitions, along with their crucial importance for a quantitatively accurate theory.
NTIS
Photoelectric Emission; Photoelectrons; Photoionization; Xenon

20050194682 Lawrence Livermore National Lab., Livermore, CA USA
Synchrotron X-Ray Study of Multilayers in Laue Geometry
Kang, H. C.; Stephenson, G. B.; Liu, C.; Conley, R.; Macrander, A. T.; Jul. 27, 2004; 12 pp.; In English
Report No.(s): DE2005-15014490; UCRL-CONF-205522; No Copyright; Avail: Department of Energy Information Bridge
Zone plates with depth to zone-width ratios as large as 100 are needed for focusing of hard x-rays. Such high aspect ratios are challenging to produce by lithography. We are investigating the fabrication of high-aspect-ratio linear zone plates by multilayer deposition followed by sectioning. As an initial step in this work, we present a synchrotron x-ray study of constant-period multilayers diffracting in Laue (transmission) geometry. Data are presented from two samples: a 200 period W/Si multilayer with d-spacing of 29 nm, and a 2020 period Mo/Si multilayer with d-spacing. By cutting and polishing we have successfully produced thin cross sections with section depths ranging from 2 to 12 mm. Transverse scattering profiles (rocking curves) across the Bragg reflection exhibit well-defined interference fringes originating from the depth of the sample, in agreement with dynamical diffraction theory for a multilayer in Laue geometry.
NTIS
Synchrotrons; X Ray Diffraction; X Rays; Laue Method

20050194712 Pen Kem, Inc., Bedford Hills, NY, USA
Development of a Dielectric Spectrometer Probe for Charge and Size Analysis of Industrial Slurries
Goetz, P.; Jan. 2003; 28 pp.; In English
Report No.(s): DE2005-820619; No Copyright; Avail: Department of Energy Information Bridge
The project focus is on the design of a small and robust remote sensor probe to meet the as yet unmet needs of industry to characterize the charge and size of colloidal dispersions (suspensions and emulsions). Such dispersions may have high particle concentration with submicron sized particles and are therefore unsuitable for optical methods. Many dispersions of interest also have particles with low density contrast which makes them unsuitable for ultrasonic analysis. Our approach combines rapid measurements of dielectric spectra of the colloid with a deconvolution of the measured spectra to obtain size distribution and charge.
NTIS
Dielectrics; Slurries; Spectrometers; Spectroscopy

20050195857 DYNACS Engineering Co., Inc., USA, NASA Glenn Research Center, Cleveland, OH, USA
Automated Multiple-Sample Tray Manipulation Designed and Fabricated for Atomic Oxygen Facility
Sechkar, Edward A.; Stueber, Thomas J.; Dever, Joyce A.; Banks, Bruce A.; Rutledge, Sharon K.; Research and Technology 1999; March 2000; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy
Extensive improvements to increase testing capacity and flexibility and to automate the in situ Reflectance Measurement System (RMS) are in progress at the Electro-Physics Branch s Atomic Oxygen (AO) beam facility of the NASA Glenn Research Center at Lewis Field. These improvements will triple the system s capacity while placing a significant portion of the testing cycle under computer control for added reliability, repeatability, and ease of use.
Derived from text
Oxygen Atoms; Fabrication

20050196032 Old Dominion Univ., Norfolk, VA USA
Bio-Inspired Concepts: Studies of Biological Response to External Electric Fields for Cellular Manipulation and Diagnostics - Modeling and Experimentation
Joshi, Ravindra; May 2005; 34 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0506; Proj-2312
Report No.(s): AD-A434845; AFRL-SR-AR-TR-05-0196; No Copyright; Avail: CASI; A03, Hardcopy

A comprehensive modeling and experimental effort was carried out to develop an understanding of cellular bio-response to short duration, high-intensity electric fields. Macroscopic models for determining the time-dependent spatially-variable electric potential and current flows at single cells were developed. This provides predictions of both transmembrane voltages and temperature changes. The macroscopic model was coupled to a nano-simulator to probe the sub-cellular response at the molecular level. Many of the observed details such as PS externalization, the time scales for pore formation, and their probable diameters were predicted. The relevant parameters of the bio-system were obtained within our group by developing the Time Domain Dielectric Spectroscopy method. The system is operational, and yields data on the conductivity and permittivities of cells and its organelles. This is a useful and important development. Cellular responses were measured based on a variety of techniques, including flow cytometry, optical microscopy and imaging. The central results were: (i) There is a critical electric field and pulse duration for cell death; (ii) The critical voltage reduces for multiple pulses and increases pulse width; (iii) PS externalization leading to cell death can be electrically triggered; and (iv) Pore formation can be reversible for short nano-second pulses. This study would be indicative of the following conclusions: (i) It may be energy efficient to use short pulses for cell death; (ii) Selective apoptotic targeting of cells appears to be possible; and (iii) Non-uniform internal potentials (arising from dipole and charge placements) promote cellular transport. Hence, their modification/disruption through molecular conformational change would alter cell functioning.
DTIC
Biological Effects; Diagnosis; Electric Fields; Models; Physiological Responses

20050196041 Naval Undersea Warfare Center, Newport, RI USA
Dynamic Response of an Elastic Plate Containing Periodic Masses
Hull, Andrew J.; Mar. 2005; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-A821085
Report No.(s): AD-A434856; NUWC-NPT-TR-11663; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report develops an analytical model that incorporates an infinite number of periodically spaced discrete masses into the equations of elasticity of a two-dimensional solid. Two specific problems are addressed. The first is that of a plate with the masses on the bottom edge, and the second is that of a plate with the masses embedded in the medium. the equations of elasticity are transformed into stress field expressions with the appropriate boundary conditions in the wave number-frequency domain. These equations are indexed using an integer shift property to obtain expressions of the higher-order dynamics of the system. Once this is accomplished, all the indexed equations of the system are written together in a single matrix equation. The problem is then solved using a truncated set of terms. The model results are compared to previously available low frequency results for solutions involving the flexural wave in the plate. A numerical example is then solved at high frequency that includes higher-order wave motion, and these results are discussed.
DTIC
Dynamic Response; Elastic Plates; Elastic Properties; Solids

20050196112 Evident Technologies, Troy, NY USA
High Performance Thermoelectric Materials Using Solution Phase Synthesis of Narrow Bandgap Core/Shell Quantum Dots Deposited Into Colloidal Crystal Thin Films
Jun. 2005; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-05-M-0046
Report No.(s): AD-A434970; No Copyright; Avail: Defense Technical Information Center (DTIC)
Thermoelectrics is the science and technology associated with thermoelectric converters, that is, the generation of electrical power based on the Seebeck effect and refrigeration by the Peltier effect. The attractive features of thermoelectric devices are their long life, low maintenance, they have no moving parts, they can be miniaturized, they do not produce emissions that might be harmful to the environment, and they are highly reliable. Thermoelectric generators are used to provide electrical power in medical, military, and deep space applications where their desirable properties outweigh their relatively high cost and low operating efficiency. In recent years there also has been an increase in applications for thermoelectric coolers for use in infrared detectors, optical communications, and computing. The widespread use of thermoelectric components is presently limited by the low figure-of-merit of presently known materials. The objective of the Phase 1 proposal was to demonstrate a new route to the realization of highly efficient bulk thermoelectric materials through engineering material structures at the nanoscale. Furthermore, the intent of our continuing work is to create these nanostructured materials using cost effective processes that will eventually lead to viable commercial products and fill a market need. In particular, interest lies in the application of nanotechnology to design thermoelectric materials whose intrinsic

electrical and thermal properties are far better than the properties of traditional bulk thermoelectric materials.
DTIC
Colloids; Crystals; Energy Gaps (Solid State); Quantum Dots; Thermoelectric Materials; Thermoelectricity; Thin Films

20050196770 Alabama Univ., Huntsville, AL, USA
Study of Isospin Correlation in High Energy Heavy Ion Interactions with the RHIC PHENIX
Takahashi, Y.; January 2005; 90 pp.; In English
Report No.(s): DE2005-821089; DOE/ER/41058-1; No Copyright; Avail: Department of Energy Information Bridge
This report describes the research work performed under the support of the DOE research grant E-FG02-97ER4108. The work is composed of three parts: (1) Visual analysis and quality control of the Micro Vertex Detector (MVD) of the PHENIX experiments carried out of Brookhaven National Laboratory. (2) Continuation of the data analysis of the EMU05/09/16 experiments for the study of the inclusive particle production spectra and multi-particle correlation. (3) Exploration of a new statistical means to study very high-multiplicity of nuclear-particle ensembles and its perspectives to apply to the higher energy experiments.
NTIS
Chirality; High Energy Interactions; Isotopic Spin; Symmetry

20050196772 Brookhaven National Lab., Upton, NY USA
Iozation Cooling Channel for Muon Beams Based on Alternating Solenoids
Gallardo, J. C.; Fermpw, R. C.; Kirk, H. G.; Palmer, R. B.; Jan. 1999; 10 pp.; In English
Report No.(s): DE2005-770896; BNL-66235; No Copyright; Avail: Department of Energy Information Bridge
The muon collider requires intense, cooled muon bunches to reach the required Luminosity. Due to the limited lifetime of the muon, the cooling process must take place very rapidly. Ionization cooling seems to be our only option, given the large emittances of the muon beam from pion decay. However, this ionization cooling method has been found quite difficult to implement in practice. We describe a scheme based on the use of liquid hydrogen absorbers followed by r.f. cavities ('pillbox' or 'open iris' type), embedded in a transport lattice based on high field solenoids. These solenoidal fields are reversed periodically in order to suppress the growth of the canonical angular momentum. This channel has been simulated in detail with independent codes, featuring conventional tracking in e.m. fields and detailed simulation of multiple scattering and straggling in the absorbers and windows. These calculations show that the 15 Tesla lattice cools in 6-D phase space by a factor (approx) 2 over a distance of 20 m.
NTIS
Angular Momentum; Cooling; Muons; Solenoids

20050196773 Brookhaven National Lab., Upton, NY, USA
Coherent Electromagnetic Heavy Ion Reactions: (1) Exact Treatment of Pair Production and Ionization; (2) Mutual Coulomb Dissociation
Baltz, A. J.; May 1999; 10 pp.; In English
Report No.(s): DE2005-770821; BNL-66644; No Copyright; Avail: Department of Energy Information Bridge
Some recent theoretical results on coherent electromagnetic processes in ultrarelativistic heavy ion reactions are surveyed. In ultrarelativistic heavy ion collisions, Coulomb induced cross sections are huge, much larger than geometric. For the RHIC case of 100 GeV x 100 GeV colliding gold ions the predicted cross section for bound-electron positron pairs is about 110 barns. The corresponding cross section for continuum electron-positron pairs has recently been recalculated to be 34,000 barns, consistent with the result of the classic formula of Landau and Lifshitz. The cross section for Coulomb dissociation of the nucleus is about 95 barns, and the cross section for ionization of a single electron on one of the ions is about 100,000 barns.
NTIS
Dissociation; Ionization; Pair Production

20050196776 Brookhaven National Lab., Upton, NY USA
Chamber Motion Measurements at the NSLS X-Ray Ring
Solomon, L.; Lynch, D.; Safranek, J.; Singh, O.; January 2005; 10 pp.; In English
Report No.(s): DE2005-770815; BNL-66495; No Copyright; Avail: Department of Energy Information Bridge
Work has been ongoing at the NSLS to improve the orbit stability of the X-Ray Ring by accounting for the thermal motion of the vacuum chamber, which supports the electron beam position monitors (BPMs). In-situ contact measurements of the

vacuum chamber motion have been carried out using support stands that have been designed and extensively tested to reduce errors associated with thermal changes in the stands themselves. Using this chamber motion as a correction to the orbit motion measured by the BPMs, the precise location of the radiation beam can be predicted. These predictions are compared with actual radiation beam measurements on the experimental floor, and with predictions based solely on BPM measurements of the electron beam position. This paper reviews this work including stand design and performance, chamber motion measurements, predictions based on these data, and results.
NTIS
X Rays; Vacuum Chambers; In Situ Measurement

20050196781 Lawrence Livermore National Lab., Livermore, CA USA
ANFO Calculations for Sedat Esen
Souers, P. C.; Vitello, P.; May 20, 2004; 14 pp.; In English
Report No.(s): DE2005-15014161; UCRL-TR-204259; No Copyright; Avail: Department of Energy Information Bridge
The calculations were run with JWL++, which is a simple reactive flow model run in a finite element code. The code is a 2-dimensional CALE-type arbitrary Lagrangian- Eulerian (ALE). This means that the problem geometry is broken into zones, each running according to Newtons Law: force equals mass times acceleration. In the main Lagrange mode, each zone contains a fixed amount of mass. This can lead over time to tangling of zones, so a bit of Eulerian behavior is allowed in unimportant but less stable parts of the problem. This allows mass to flow between zones, thereby avoiding the tangling. The problem is calculated in every zone and every time cycle, and the detonation progresses from the point of initation across the sample. The pressure is calculated from a linear combination of a Murnhan unreacted equation of state and a reacted explosive JWL.
NTIS
Finite Element Method; Computation; Two Dimensional Models

20050196782 Lawrence Livermore National Lab., Livermore, CA USA
High Resolution Velocity Structure in Eastern Turkey
Pasyanos, M.; Gok, R.; Zor, E.; Walter, W.; Sep. 07, 2004; 8 pp.; In English
Report No.(s): DE2005-15014178; UCRL-CONF-206422; No Copyright; Avail: Department of Energy Information Bridge
No abstract available
High Resolution; Velocity Distribution

20050196784 Brookhaven National Lab., Upton, NY USA
High Resolution Powder Diffraction and Structure Determination
Cox, D. E.; Jun. 1999; 76 pp.; In English
Report No.(s): DE2005-770814; BNL-66482; No Copyright; Avail: Department of Energy Information Bridge
It is clear that high-resolution synchrotrons X-ray powder diffraction is a very powerful and convenient tool for material characterization and structure determination. Most investigations to date have been carried out under ambient conditions and have focused on structure solution and refinement. The application of high-resolution techniques to increasingly complex structures will certainly represent an important part of future studies, and it has been seen how ab initio solution of structures with perhaps 100 atoms in the asymmetric unit is within the realms of possibility. However, the ease with which temperature-dependence measurements can be made combined with improvements in the technology of position-sensitive detectors will undoubtedly stimulate precise in situ structural studies of phase transitions and related phenomena. One challenge in this area will be to develop high-resolution techniques for ultra-high pressure investigations in diamond anvil cells. This will require highly focused beams and very precise collimation in front of the cell down to dimensions of 50 (micro)m or less. Anomalous scattering offers many interesting possibilities as well. As a means of enhancing scattering contrast it has applications not only to the determination of cation distribution in mixed systems such as the superconducting oxides discussed in Section 9.5.3, but also to the location of specific cations in partially occupied sites, such as the extra-framework positions in zeolites, for example. Another possible application is to provide phasing information for ab initio structure solution. Finally, the precise determination of f as a function of energy through an absorption edge can provide useful information about cation oxidation states, particularly in conjunction with XANES data. In contrast to many experiments at a synchrotron facility, powder diffraction is a relatively simple and user-friendly technique, and most of the procedures and software for data analysis are familiar to laboratory diffractionists. This is reflected in the fact that there are already dedicated instruments for powder diffraction at a number of synchrotrons sources, including the NSLS, the Synchrotrons Radiation

Source, Daresbury, the Photon Factory, Tsukuba and HASYLAB. In addition, most general purpose beamlines can be adapted for powder diffraction experiments fairly easily. Dedicated beamlines are also planned or under consideration at the next generation of synchrotrons sources, the European Synchrotron Radiation Facility, Grenoble, the Advanced Photon Source, Argonne, and the SPring-8 machine at Harima. These will be high brilliance sources with a much harder radiation spectrum that will offer many new possibilities for powder diffraction experiments, especially at energies above 10 keV.
NTIS
Diffraction; High Resolution; Photons; Powder (Particles); X Ray Diffraction

20050196787 Lawrence Livermore National Lab., Livermore, CA USA
Renewable Liquid Optics with Magneto-Electrostatic Control
Ryutov, D.; Toor, A.; Jun. 25, 2001; 38 pp.; In English
Report No.(s): DE2005-15013222; UCRL-JC-142094; No Copyright; Avail: Department of Energy Information Bridge

We suggest a new class of high-flux renewable optics, in particular, for the use at the Xray free electron laser, LCLS, which is under discussion now. The size of optical elements we have in mind is from a fraction of a square centimeter to a few square centimeters. We suggest that working fluid be pressed through a porous substrate (made, e.g., of fused capillaries) to form a film, a few tens to a hundred microns thick. After the passage of an intense laser pulse, the liquid film is sucked back through the substrate by a reversed motion of the piston, and formed anew before the next pulse. The working surface of the film is made flat by capillary forces. We discuss the role of viscous, gravitational, and capillary forces in the dynamics of the film and show that the properly made film can be arbitrarily oriented with respect to the gravitational force. This makes the proposed optics very flexible. We discuss effects of vibrations of the supporting structures on the quality of optical elements. Limitations on the radiation intensity are formulated. We show how the shape of the film surface can be controlled by electrostatic and magnetic forces, allowing one to make parabolic mirrors and reflecting diffraction gratings.
NTIS
Electrostatics; Free Electron Lasers; Liquids

20050196788 Lawrence Livermore National Lab., Livermore, CA USA
Neutron Skyshine Considerations For The NIF Shielding Design
Singh, M. S.; Mecozzi, J. M.; Tobin, M. T.; Feb. 05, 2005; 8 pp.; In English
Report No.(s): DE2005-15013678; UCRL-CONF-202214; No Copyright; Avail: Department of Energy Information Bridge

A series of coupled neutron-photon transport Monte-Carlo calculations was performed to estimate the roof shielding required to limit the skyshine dose to less than 1 mrem/y at the site boundary when conducting DT experiments with annual fusion yields up to 1200 MJ (4.2E20 neutrons/y). The NIF shielding design consists of many different components. The basic components include 10-cm-thick Al chamber with 40-cm-thick target chamber gunite shield having multiple penetrations, 1.83-m-thick concrete Target Bay walls, 1.37- m-thick concrete roof, and multiple concrete floors with numerous penetrations. Under this shielding configuration, the skyshine dose at the nearest site-boundary was calculated to be less than 0.2 mrem/y for all possible target illumination configurations. The potential dose at the site boundary would be about one-tenth of the cosmic neutron dose that we measured with bubble neutron detectors on board a commercial roundtrip flight from SF to Rochester. This incremental dose increase is well within the normal fluctuations (noise) of the natural background radiation in the Livermore area. The skyshine dose has no impact on the public. The skyshine dose trends at ground and elevated levels are plotted as a function of distance from 20 m to 1000 m from the center of the target bay. The differential neutron and photon energy flux emerging from the NIF roof and at several locations on the ground is plotted to show how it shifts with distance. The results of this study are compared with the neutron skyshine studies done at highenergy accelerators by R. H. Thomas.
NTIS
Neutron Sources; Neutrons; Shielding

20050196791 Lawrence Livermore National Lab., Livermore, CA USA
Axial Electron Heat Loss Mirror Devices Revisited
Ryutov, D. D.; Aug. 17, 2004; 14 pp.; In English
Report No.(s): DE2005-15014698; UCRL-CONF-206078; No Copyright; Avail: Department of Energy Information Bridge

An issue of the axial electron heat loss is of a significant importance for mirror-based fusion devices. This problem has been considered in a number of publications but it is still shrouded in misconceptions. In this paper we revisit it once again. We discuss the following issues: (1) Formation of the electron distribution function in the end tank at large expansion ratios; (2) The secondary emission from the end plates and the ways of suppressing it (if needed); (3) Ionization and charge exchange

in the presence of neutrals in the end tanks; (4) Instabilities caused by the peculiar shape of the electron distribution function and their possible impact on the electron heat losses; (5) Electron heat losses in the pulsed mode of operation of mirror devices.
NTIS
Cooling; Electronic Equipment; Electrons; Mirrors

20050196793 Lawrence Livermore National Lab., Livermore, CA USA
Exploring Heavy-Quark Energy Loss via b-tagging in Heavy Ion Collisions at the LHC
Klay, J. L.; Mar. 14, 2005; 12 pp.; In English
Report No.(s): DE2005-15011622; UCRL-PROC-210458; No Copyright; Avail: Department of Energy Information Bridge
A strategy to study flavor-dependent parton energy loss by tagging heavy quark jets in p+p, p+Pb and Pb+Pb collisions at the LHC is discussed. Estimates for production cross-sections and experimental techniques employed at collider detectors to search for Q(bar Q) jets are presented and a brief evaluation of the capabilities of CMS, ALICE and ATLAS detectors are given.
NTIS
Charged Particles; Energy Dissipation; Heavy Ions; Ionic Collisions; Marking; Quarks

20050196795 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Quadratic Finite Element Methods for 1D Deterministic Neutron Transport
Tolar, D. R.; Ferguson, J. M.; Nov. 30, 2004; 12 pp.; In English
Report No.(s): DE2005-15014727; UCRL-PROC-208271; No Copyright; Avail: Department of Energy Information Bridge
We focus on improving the angular discretization of the angular flux for the one-dimensional (1D) spherical geometry neutron transport equation. Unlike the conventional Sn method, we model the angular dependence of the flux with a Petrov-Galerkin finite element approximation for the differencing of the angular variable in developing the 1D spherical geometry Sn equations. That is, we use both a piecewise bi-linear and a quadratic function in each angular bin to approximate the angular dependence of the flux. This new algorithm that we have developed shows faster convergence with angular resolution than conventional Sn algorithms.
NTIS
Finite Element Method; Neutrons; Approximation

20050196798 Katholieke Univ. te Leuven, Belgium
Multitechnique Analysis of the Lattice Structures of Highly Siliceous Zeolites
Delmon, B.; Yates, J. T.; January 1999; 20 pp.; In English
Report No.(s): DE2005-770805; BNL-66771; No Copyright; Avail: Department of Energy Information Bridge
The combined use of high-resolution solid state NMR techniques (both 1D and 2D) with synchrotron-based powder x-ray diffraction studies yields detailed information on the lattice structures of highly siliceous zeolites. The two methods are complementary, the former probing short range ordering and structures while the latter is sensitive to long range orderings and periodicities.
NTIS
Structural Analysis; X Ray Diffraction; Zeolites

20050196799 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Brookhaven National Lab., Upton, NY USA
Using Servers to Enhance Control System Capability
Bickley, M.; Bowling, B. A.; Bryan, D. A.; van Zeijts, J.; White, K. S.; Apr. 1999; 10 pp.; In English
Report No.(s): DE2005-770755; BNL-66596; No Copyright; Avail: Department of Energy Information Bridge
Many traditional control systems include a distributed collection of front end machines to control hardware. Backend tools are used to view, modify, and record the signals generated by these front end machines. Software servers, which are a middleware layer between the front and back ends, can improve a control system in several ways. Servers can enable on-line processing of raw data, and consolidation of functionality. It many cases data retrieved from the front end must be processed in order to convert the raw data into useful information. These calculations are often redundantly performance by different programs, frequently offline. Servers can monitor the raw data and rapidly perform calculations, producing new signals which can be treated like any other control system signal, and can be used by any back end application. Algorithms can be incorporated to actively modify signal values in the control system based upon changes of other signals, essentially producing

feedback in a control system. Servers thus increase the flexibility of a control system. Lastly, servers running on inexpensive UNIXworkstations can relay or cache frequently needed information, reducing the load on front end hardware by functioning as concentrators. Rather than many back end tools connecting directly to the front end machines, increasing the work load of these machines, they instead connect to the server. Servers like those discussed above have been used successfully at the Thomas Jefferson National Accelerator Facility to provide functionality such as beam steering, fault monitoring, storage of machine parameters, and on-line data processing. The authors discuss the potential uses of such servers, and share the results of work performed to date.
NTIS
Algorithms; Applications Programs (Computers); Consolidation; Automatic Control

20050196817 Brookhaven National Lab., Upton, NY, USA
Nuclear Information Services at the National Nuclear Data Center
Burrows, T. W.; Dunford, C. L.; January 2005; 10 pp.; In English
Report No.(s): DE2005-15010797; BNL-73536-2005-CP; No Copyright; Avail: Department of Energy Information Bridge
The National Nuclear Data Center has provided remote access to its databases and other resources since 1986. This year we have completed the modernization of our databases and Web site. Resources available from our Web site will be summarized and some of the major improvements described in more detail.
NTIS
Data Bases; Information Systems

20050196818 Brookhaven National Lab., Upton, NY, USA
Nuclear Science References as a Tool for Data Evaluation
Winchell, D. F.; January 2005; 10 pp.; In English
Report No.(s): DE2005-15010799; BNL-73539-2005-CP; No Copyright; Avail: Department of Energy Information Bridge
For several decades, the Nuclear Science References database has been maintained as a tool for data evaluators and for the wider pure and applied research community. This contribution will describe the database and recent developments in web-based access.
NTIS
Data Bases; Data Base Management Systems

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ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20050192479 NASA Dryden Flight Research Center, Edwards, CA, USA
Flight Demonstration Of Low Overpressure N-Wave Sonic Booms And Evanescent Waves
Haering, Edward A., Jr.; Smolka, James W.; Murray, James E.; Plotkin, Kenneth J.; [2005]; 4 pp.; In English; 17th International Symposium of Nonlinear Acoustics, 21-22 Jul. 2005, State College, PA, USA; Copyright; Avail: CASI; A01, Hardcopy
The recent flight demonstration of shaped sonic booms shows the potential for quiet overland supersonic flight, which could revolutionize air transport. To successfully design quiet supersonic aircraft, the upper limit of an acceptable noise level must be determined through quantitative recording and subjective human response measurements. Past efforts have concentrated on the use of sonic boom simulators to assess human response, but simulators often cannot reproduce a realistic sonic boom sound. Until now, molecular relaxation effects on low overpressure rise time had never been compared with flight data. Supersonic flight slower than the cutoff Mach number, which generates evanescent waves, also prevents loud sonic booms from impacting the ground. The loudness of these evanescent waves can be computed, but flight measurement validation is needed. A novel flight demonstration technique that generates low overpressure N-waves using conventional military aircraft is outlined, in addition to initial quantitative flight data. As part of this demonstration, evanescent waves also will be recorded.
Author
Evanescent Waves; Flight Tests; Loudness; Noise Intensity; Supersonic Flight

20050192583 NASA Glenn Research Center, Cleveland, OH, USA

Ultrasonic Guided-Wave Scan System Used to Characterize Microstructure and Defects in Ceramic Composites

Roth, Don J.; Cosgriff, Laura M.; Martin, Richard E.; Verrilli, Michael J.; Bhatt, Ramakrishna T.; Research and Technology 2003; May 2004; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

Ceramic matrix composites (CMCs) are being developed for advanced aerospace propulsion applications to save weight, improve reuse capability, and increase performance. However, mechanical and environmental loads applied to CMCs can cause discrete flaws and distributed microdamage, significantly reducing desirable physical properties. Such microdamage includes fiber/matrix debonding (interface failure), matrix microcracking, fiber fracture and buckling, oxidation, and second phase formation. A recent study (ref. 1) of the durability of a C/SiC CMC discussed the requirement for improved nondestructive evaluation (NDE) methods for monitoring degradation in these materials. Distributed microdamage in CMCs has proven difficult to characterize nondestructively because of the complex microstructure and macrostructure of these materials. This year, an ultrasonic guided-wave scan system developed at the NASA Glenn Research Center was used to characterize various microstructural and flaw conditions in SiC/SiC (silicon carbide fiber in silicon carbide matrix) and C/SiC (carbon fiber in silicon carbide matrix) CMC samples.

Derived from text

Ceramic Matrix Composites; Ultrasonic Radiation

20050192611 NASA Glenn Research Center, Cleveland, OH, USA

Ultrasonic Waves in Water Visualized With Schlieren Imaging

Juergens, Jeffrey R.; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Acoustic Liquid Manipulation project at the NASA Glenn Research Center at Lewis Field is working with high-intensity ultrasound waves to produce acoustic radiation pressure and acoustic streaming. These effects can be used to propel liquid flows to manipulate floating objects and liquid surfaces. Interest in acoustic liquid manipulation has been shown in acoustically enhanced circuit board electroplating, microelectromechanical systems (MEMS), and microgravity space experiments. The current areas of work on this project include phased-array ultrasonic beam steering, acoustic intensity measurements, and schlieren imaging of the ultrasonic waves.

Derived from text

Noise Measurement; Acoustic Imaging; Ultrasonic Radiation; Ultrasonics

20050192613 NASA Glenn Research Center, Cleveland, OH, USA

Reduced-Noise Gas Flow Design Guide Developed as a Noise-Control Design Tool for Meeting Glenn's Hearing Conservation and Community Noise Goals

Cooper, Beth A.; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A Reduced-Noise Gas Flow Design Guide has been developed for the NASA Glenn Research Center at Lewis Field by Nelson Acoustical Engineering of Elgin, Texas. Gas flow systems are a significant contributor to the noise exposure landscape at Glenn. Because of the power of many of these systems, hearing conservation and community noise are important issues. The purpose of the Guide is to allow Glenn engineers and designers to address noise emission and control at the design stage by using readily available system parameters. Although the Guide was developed with Glenn equipment and systems in mind, it is expected to have wide application in industry.

Derived from text

Gas Flow; Noise Reduction; Noise Measurement

20050195981 Massachusetts Inst. of Tech., Cambridge, MA USA

From Word-Spotting to OOV Modeling

Fitzpatrick, Paul; Jan. 2001; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434772; No Copyright; Avail: CASI; A01, Hardcopy

This paper explores one dimension along which word spotting and speech recognition differ: the nature of the background model. In word spotting, a relatively small number of keywords float on a sea of unknown words. In speech recognition, an occasional unknown word punctuates utterances that are otherwise completely within the vocabulary. Despite this difference in viewpoint, in some circumstances implementations of the two may become very similar. When transcribed data is available for a domain, word spotting benefits from the more detailed background model this can support. The manner in which the background is modeled in these cases is reminiscent of speech recognition. For example, a large vocabulary with good

coverage may be extracted from the corpus, so that relatively few words in an utterance remain unmodeled. In this case, the situation is qualitatively similar to OOV modeling in a conventional speech recognizer, except that the vocabulary is strictly divided into 'filler' and 'keyword.' This paper describes a mechanism for bootstrapping from a relatively weak background model for word spotting, where OOV words dominate, to a much stronger model where many more word or phrase clusters have been moved to the foreground and explicitly modeled. With this increase in vocabulary comes an increase in the potency of language modeling, boosting performance on the original vocabulary. This paper shows how a conventional speech recognizer can be convinced to cluster frequently occurring acoustic patterns, without requiring the existence of transcribed data.
DTIC
Speech Recognition; Voice Communication; Words (Language)

20050196020 Scripps Institution of Oceanography, La Jolla, CA USA
Studying Shallow Water Environmental Acoustic Fluctuations with Broadband Measurements, and Fluctuations & Invariants in Shallow Water
D'Spain, Gerald; Kuperman, William; May 2005; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-99-1-0416
Report No.(s): AD-A434826; MPL-TM-483; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report describes the research performed on behalf of the Office of Naval Research on Waveguide Invariants, Fluctuations and noise, and the study of feedback noise phenomenon in shallow water. The results showed both theoretically and experimentally there was a spectral focusing when propagation paths transitioned from one type to another. Additionally, the robust presence of the invariant theory in shallow water broadband data was demonstrated experimentally.
DTIC
Acoustics; Broadband; Invariance; Measurement; Shallow Water; Waveguides

20050196034 Scripps Institution of Oceanography, La Jolla, CA USA
Acoustic and Visual Monitoring for Marine Mammals at the Southern California Off-Shore Range (SCORE)
Hildebrand, John A.; Feb. 2005; 168 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-00-1-0572
Report No.(s): AD-A434847; MPL-TM-500; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report describes the research funded by the Office of Naval research (grant #N00014-00-1-0572) aimed at assessing marine mammal populations in prime areas of Naval interest: the South California Offshore Range (SCORE). Acoustic recordings and shipboard surveys were employed to study marine mammal behavior and populations. The ultimate goal of these studies is to determine the potential impacts on the marine mammals from Naval activities.
DTIC
Marine Mammals; Whales

20050196050 Woods Hole Oceanographic Inst., MA USA
Inversion for Subbottom Sound Velocity Profiles in the Deep and Shallow Ocean
Souza, Luiz L.; Feb. 2005; 303 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-03-1-0397
Report No.(s): AD-A434869; MIT/WHOI-2005-03; No Copyright; Avail: Defense Technical Information Center (DTIC)
We investigate the application of acoustic measurement sin the ocean to measurer the sound velocity profile (svp) in the subbottom. For the deep water ocean, an exact method based on the Gelfand-Levitan integral equation is evaluated. The input data is the complex plane-wave reflection coefficient. We apply the method to experimental acoustic data and estimate the reflection coefficient and the svp in the seabed.
DTIC
Acoustic Velocity; Inversions; Oceans; Velocity Distribution; Water Depth

20050196077 University of Southern California, Los Angeles, CA USA
An Experimental Study of Sonic Boom Penetration Under a Wavy Air-Water Interface
Fincham, Adam; Maxworthy, Tony; Apr. 2002; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434922; USC-AME-9-11-2001; No Copyright; Avail: Defense Technical Information Center (DTIC)
A laboratory experiment was designed and performed to ascertain the difference in underwater response to sonic boom

laboratory between flat and wavy surface models and their depth-dependent rule overpressure attenuation. Waveforms of overpressure were recorded in a water-filled tank, fitted with a surface-wave maker, during over-flight of the supersonic projectiles. Sawyers' (1968) theory for the flat interface has been validated to a depth of at least four signature lengths. The theory of Cheng and Lee (2000) for a wavy surface has been confirmed in several respects. Firstly, the predicted overpressure attenuation with depth to the one-half power has been found to be correct over depths up to four signature lengths. Secondly, the predicted frequencies and the fore-to-aft frequency shift have been confirmed by these laboratory-scale experiments.
DTIC
Penetration; Sonic Booms

20050196084 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Short-Range Seismic and Acoustic Signature Measurements Through Forest
Decato, Stephen N.; Albert, Donald G.; Perron, Frank E., Jr.; Carbee, David L.; May 2005; 136 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434934; ERDC/CRREL-TR-05-10; No Copyright; Avail: Defense Technical Information Center (DTIC)

The effect of forests on low frequency military noise propagation is unknown. As part of a joint project, ERDC-CERL and ERDC CRREL conducted measurements at the Lone Star Army Ammunition Plant located in Texarkana, Texas, to investigate these effects. In this report, the short-range measurements conducted by ERDC-CRREL are documented. Blast noise waveforms produced by C4 explosions at distances from 30 to 567 m were recorded and are presented in this report. In all, 42 different explosions were recorded, producing 314 high quality pressure waveforms for analysis. Additional reports documenting the long-range measurements and analyzing the recorded data are in preparation.
DTIC
Acoustic Properties; Forests; Signatures

20050196089 Scripps Institution of Oceanography, La Jolla, CA USA
Instrumentation for the High Resolution Measurement of Ocean Surface Waves and Currents over km Square Areas
Smith, Jerome; Pinkel, Robert; Jun. 2005; 6 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0467
Report No.(s): AD-A434942; No Copyright; Avail: CASI; A02, Hardcopy

The objective of this project, funded by the Office of Naval Research, was to develop imaging sonar with increasingly higher resolution. With modern advancements in digital electronics, it is now feasible to digitize incoming sonar data at the carrier frequency, in this case, approximately 3 x 50 kHz. Subsequent homodying and data compression can be done using software. The sonar technology was tested on two occasions on the research platform R/V FLIP. On the first occasion it was mounted on FLIP at a depth of 20 meters and operated over a 20-day period with FLIP moored in 200 meters of deep water. In these summer experiments the mixed layer depth was very thin. The sonar was positioned in the upper thermocline, where sound is strongly downward refracted. Thus, the sonar scattered primarily from the sea surface for the first 800-meter range, and subsequently recorded a mix of surface and bottom echoes to ranges greater than 2.5 km. A second data collection opportunity occurred in Sep-Oct 2002, when FLIP was moored off the Hawaiian Island of Oahu, observing large amplitude internal waves generated by tidal flow over the Keana Ridge. Here the depth of the mixed layer was 25 meters and breaking waves, which provide subsurface bubbles as scattering targets, were common. The sonar was operated continuously for about 20 days, achieving ranges of 1.5 km from pure surface scattering. The dominant signal seen was the surface wave field, which was quite energetic during trade wind conditions. When these signals were low-pass filtered in time, images of underlying Langmuir cells emerged. Further filtering has begun to reveal the internal wave signature. The next developmental task is to create a real-time analysis and display capability to match the speed of this sonar, which digitally recorded at a rate of 100 Gigabytes per day.
DTIC
High Resolution; Measuring Instruments; Ocean Currents; Ocean Surface; Sonar; Surface Waves; Water Waves

20050196157 Utah State Univ., Logan, UT USA
Iterative Simulation of Elastic Wave Scattering in Arbitrary Dispersions of Spherical Particles
Doyle, Timothy E.; Mar. 2005; 30 pp.; In English
Contract(s)/Grant(s): F04611-98-C-0005; Proj-1011
Report No.(s): AD-A435039; No Copyright; Avail: Defense Technical Information Center (DTIC)

A numerical modeling approach was developed to simulate the propagation of shear and longitudinal sound waves in

arbitrary, dense dispersions of spherical particles. The scattering interactions were modeled with vector multipole functions and boundary condition solutions for each particle. Multiple scattering was simulated by translating the scattered wave fields from one particle to another with the use of translational addition theorems, summing the multiple-scattering contributions, and recalculating the scattering using an iterative method. The theory and initial results for the model are presented, including an integral derivation for the translational addition theorems. The model can simulate 3D material microstructures with a variety of particle size distributions, compositions, and volume fractions. To test the model, spectra and wave field patterns were generated from both ordered and disordered microstructures containing up to several hundred particles. The model predicts wave propagation phenomena such as refractive focusing, mode conversion, and band gap phenomena. The convergence of the iterations ranges from excellent to fair, and is dependent on the field (longitudinal or shear), particle configuration, and elastic wave frequency. The model is currently limited by the computation of sufficiently high multipole order for the simulation of dense particle dispersions.
DTIC
Elastic Waves; Scattering; Simulation; Spherical Waves; Wave Scattering

20050196647 Research and Technology Organization, Neuilly-sur-Seine, France
Personal Hearing Protection including Active Noise Reduction
June 2005; 114 pp.; In English; Personal Hearing Protection Including Active Noise Reduction, 25-26 Oct. 2004, Warsaw, Poland; See also 20050196648 - 20050196652
Report No.(s): RTO-EN-HFM-111; AC/323(HFM-111)TP/56; Copyright; Avail: CASI; C01, CD-ROM; A06, Hardcopy

Personal hearing protection and speech communication facilities are essential for optimal performance in military operations. High noise levels increase the risk of noise induced hearing loss and deterioration of communications. These proceedings from a lecture series on hearing protection and speech communication discuss the state-of-the-art of these topics. This includes: 1) The physiological effects in the ear due to a high noise exposure and criteria for an adequate protection; 2) The construction and performance of passive hearing protectors (isolation of noise); 3) Active hearing protectors (electronic generation of anti noise); 4) Optimal design or selection of systems by various assessment methods; and 5) Realistic examples of military applications. The lecture series were held in Poland, Belgium, and the USA.
Author (revised)
Active Control; Ear; Ear Protectors; Noise Reduction; Human Factors Engineering

20050196648 Institut Franco-Allemand de Recherches, Saint-Louis, France
Hearing and Hearing Protection
Dancer, A. L.; Personal Hearing Protection including Active Noise Reduction; June 2005, pp. 1-1 - 1-19; In English; See also 20050196647; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We study the origin of the Noise-Induced Hearing Losses (NIHL) in relation to the morphology and the physiology of the ear. We describe the mechanical and metabolic effects of the noises on the inner ear and their consequences on hearing. We discuss the importance and the limitations of the protective mechanisms. Finally, we present new possibilities to protect the ear against noise and to treat the acoustic trauma.
Author
Ear; Ear Protectors; Hearing; Physiology; Morphology

20050196649 Institut Franco-Allemand de Recherches, Saint-Louis, France
Active Hearing Protection Systems and Their Performance
Buck, K.; Zimpfer-Jost, V.; Personal Hearing Protection including Active Noise Reduction; June 2005, pp. 3-1 - 3-22; In English; See also 20050196647; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The present paper gives a brief history of active noise cancellation. It shows that the possibility of using ANR in hearing protection devices was proposed long before the first commercial devices became known. The basic theory of active noise cancellation is quite simple and was first described in the 1930's. The basic principles and the different approaches to obtain active noise cancellation are described in this paper. Different ANR techniques are presented (feed-forward, feedback) as well as different possibilities for their implementation (analog and/or digital). The possibility for optimum insertion of a communication signal into an ANR hearing protector is described. The impact of ANR protectors on the noise exposure and on the speech intelligibility is discussed. Critical parameters like stability and overload are discussed and some basic design

rules will be shown. The problems arising during an implementation of ANR in earplugs will finally be discussed.
Author
Ear Protectors; Hearing; Active Control; Electroacoustics; Noise Reduction

20050196650 Air Force Research Lab., Wright-Patterson AFB, OH, USA
Passive Hearing Protection Systems and Their Performance
McKinley, Richard; Bjorn, Valerie; Personal Hearing Protection including Active Noise Reduction; June 2005, pp. 2-1 - 2-13; In English; See also 20050196647; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

While ideally noise should be reduced at the source, in the military environment the most effective solution in terms of both cost and operational effectiveness has been to provide personnel with personal hearing protection. This protection may be in the form of either an earplug that occludes the ear canal or a circumaural protector that inserts a barrier between the ambient noise and the ear. For both devices the level of passive protection provided changes with frequency. A great deal of research was conducted in the 1940/50s to define the mechanisms and parameters that appeared to limit the performance of these types of protectors and this presentation will provide an overview of the findings of this early research. By the 1970s the performance of such devices, particularly those used in military applications, had been best optimized for use with the types of cranial protection being worn by soldiers, sailors, and aircrew. Since that time the major thrust in hearing protection enhancement has been the development and integration of Active Noise Reduction (ANR) systems where an electronic circuit is incorporated into the device to provide additional active attenuation in addition to the passive attenuation. ANR has provided significant benefits in low frequency attenuation and provides complementary performance to the passive device. However, for future military noise environments ANR headsets and ANR earplugs will not individually provide sufficient levels of protection, and passive earplugs and earmuffs may have to be used in some combination to provide adequate hearing protection. Recent research developments have resulted in improved passive earplug and earmuff attenuation performance. Deep inserted custom earplug performance and custom earmuff/earcushion design techniques have provided a substantial increase in hearing protection. Issues associated with the fitting of personal hearing protection and their performance in the field will also be discussed.
Author
Ear Protectors; Noise Reduction; Active Control; Acoustics

20050196651 Institute for Human Factors TNO, Soesterberg, Netherlands
Assessment and Standardization of Personal Hearing Protection including Active Noise Reduction
Steeneken, Herman J. M.; Personal Hearing Protection including Active Noise Reduction; June 2005, pp. 4-1 - 4-19; In English; See also 20050196647; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The performance of passive hearing protection is normally quantified by the sound attenuation or insertion loss (IL). The IL allows prediction of the noise level at the eardrum for a given ambient noise spectrum. A subjective test (with test-signal levels at the threshold of hearing) is normally used to measure the sound attenuation. Active noise reduction requires a different assessment method. Due to self-noise and level dependency, assessment methods operating at threshold level cannot be used and have to be replaced by objective methods. The effect of high noise levels and impulsive noises may introduce a non-linear behaviour of active systems. Therefore, the use of artificial heads is applied to avoid the risk of introduction of temporary or permanent hearing loss. Comparison of results from subjective and objective test methods will be discussed. Prediction of the noise dose, representative for a certain noise condition, can be obtained by consideration of the environmental noise spectrum, the insertion loss of the hearing protector and an estimation of the variance of the insertion loss among individual users. Examples of such a prediction (by using a spreadsheet) will be given at the lecture. Speech communication quality is an important issue for use at operational conditions. The noise level at the ear is one of the major variables that define the speech communication quality. Subjective and objective assessment methods for speech communication systems will be presented and discussed. Prediction of the speech intelligibility of a communication system (in a similar condition as presented for the noise dose) will be demonstrated by using an objective intelligibility measure. Some performance measures for hearing protection, speech communication and criteria for speech quality are standardised by international bodies. International standards are provided by ISO, CEN, and IEC.
Author
Acoustic Attenuation; Ear Protectors; Hearing; Technology Assessment; Noise Reduction; Standardization

20050196652 QinetiQ Ltd., Farnborough, UK

Defining the Cockpit Noise Hazard, Aircrew Hearing Damage Risk and the Benefits Active Noise Reduction Headsets Can Provide

James, S.; Personal Hearing Protection including Active Noise Reduction; June 2005, pp. 5-1 - 5-23; In English; See also 20050196647; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Over the years, cockpit noise levels in military aircraft have been steadily increasing, particularly in fast jets. As the noise levels increase, greater levels of personal hearing protection are required to keep aircrew noise dose within legislative levels and speech and non-speech signal communications intelligible during front line operations. If the predictions of noise levels in the next generation of fast jets are confirmed, then even more effective mitigation techniques will be needed. This paper outlines the problem areas in the military cockpit including the contribution cockpit noise and electrical communications make to aircrew noise dose and the benefits offered by newer personal protection technologies such as Active Noise Reduction. Results of both experimental trials and in-service operational trials are presented.

Author

Cockpits; Damage; Hearing; Noise Reduction; Active Control; Earphones; Flight Crews; Jet Aircraft Noise; Aircraft Hazards

20050196669 NASA Glenn Research Center, Cleveland, OH, USA

Validation of the Small Hot Jet Acoustic Rig for Jet Noise Research

Bridges, James; Brown, Clifford A.; [2005]; 15 pp.; In English; 11th Aeroacoustics Conference, 23-25 May 2005, Monterey, CA, USA

Contract(s)/Grant(s): 22-781-30-62

Report No.(s): AIAA Paper 2005-2846; Copyright; Avail: CASI; A03, Hardcopy

The development and acoustic validation of the Small Hot Jet Aeroacoustic Rig (SHJAR) is documented. Originally conceived to support fundamental research in jet noise, the rig has been designed and developed using the best practices of the industry. While validating the rig for acoustic work, a method of characterizing all extraneous rig noise was developed. With this in hand, the researcher can know when the jet data being measured is being contaminated and design the experiment around this limitation. Also considered is the question of uncertainty, where it is shown that there is a fundamental uncertainty of 0.5dB or so to the best experiments, confirmed by repeatability studies. One area not generally accounted for in the uncertainty analysis is the variation which can result from differences in initial condition of the nozzle shear layer. This initial condition was modified and the differences in both flow and sound were documented. The bottom line is that extreme caution must be applied when working on small jet rigs, but that highly accurate results can be made independent of scale.

Author

Aeroacoustics; Jet Aircraft Noise; Noise (Sound)

20050196683 Ohio Aerospace Inst., OH, USA, NASA Glenn Research Center, Cleveland, OH, USA

Damage Assessment of Creep Tested and Thermally Aged Metallic Alloys Using Acousto-Ultrasonics

Gyekenyesi, Andrew L.; Kautz, Harold E.; Baaklini, George Y.; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

In recent years emphasis has been placed on the early detection of material changes experienced in turbine powerplant components. During the scheduled overhaul of a turbine, the current techniques of examination of various hot section components aim to find flaws such as cracks, wear, and erosion, as well as excessive deformations. Thus far, these localized damage modes have been detected with satisfactory results. However, the techniques used to find these flaws provide no information on life until the flaws are actually detected. Major improvements in damage assessment, safety, as well as more accurate life prediction could be achieved if nondestructive evaluation (NDE) techniques could be utilized to sense material changes that occur prior to the localized defects mentioned. Because of elevated temperatures and excessive stresses, turbine components may experience creep behavior. As a result, it is desirable to monitor and access the current condition of such components. Research at the NASA Glenn Research Center involves developing and utilizing an NDE technique that discloses distributed material changes that occur prior to the localized damage detected by the current methods of inspection. In a recent study, creep processes in a nickel-base alloy were the life-limiting condition of interest, and the NDE technique was acousto-ultrasonics (AU). AU is an NDE technique that utilizes two ultrasonic transducers to interrogate the condition of a test specimen. The sending transducer introduces an ultrasonic pulse at a point on the surface of the specimen while a receiving transducer detects the signal after it has passed through the material. The goal of the method is to correlate certain parameters of the detected waveform to characteristics of the material between the two transducers. Here, the waveform parameter of interest is the attenuation due to internal damping for which information is being garnered from the frequency domain. The

parameters utilized to indirectly quantify the attenuation are the ultrasonic decay rate as well as various moments of the frequency power spectrum. A new, user-friendly, graphical interface AU system was developed at NASA Glenn. This system is an all-inclusive, multifunction system that controls the sending and receiving ultrasonic transducers as well as all posttest signal analysis. The system's postprocessing software calculates the multiple parameters used to study the material of interest.
Derived from text
Aging (Metallurgy); Damage Assessment; Ultrasonics

20050196696 NASA Glenn Research Center, Cleveland, OH, USA
The 90 deg Acoustic Spectrum of a High Speed Air Jet
Goldstein, Marvin E.; February 12, 2004; 33 pp.; In English
Report No.(s): E-14396; No Copyright; Avail: CASI; A03, Hardcopy

Tam and Auriault successfully predicted the acoustic spectrum at 90deg to the axis of a high speed air jet by using an acoustic equation derived from ad hoc kinetic theory-type arguments. The present paper shows that similar predictions can be obtained by using a rigorous acoustic analogy approach together with actual measurements of the relevant acoustic source correlations. This puts the result on a firmer basis and enables its extension to new situations and to the prediction of sound at other observation angles.
Author
Air Jets; Sound Generators; Kinetic Theory; High Speed

20050196703 NASA Glenn Research Center, Cleveland, OH, USA
Broadband Noise Reduction of a Low-Speed Fan Noise Using Trailing Edge Blowing
Sutliff, Daniel L.; June 2005; 19 pp.; In English; 11th Aeroacoustics Conference, 23-25 May 2005, Monterey, CA, USA
Contract(s)/Grant(s): WBS 22-781-30-64
Report No.(s): E-15171; NASA/TM-2005-213814; AIAA Paper 2005-3028; No Copyright; Avail: CASI; A03, Hardcopy

An experimental proof-of-concept test was conducted to demonstrate reduction of rotor-stator interaction noise through the use of rotor-trailing edge blowing. The velocity deficit from the viscous wake of the rotor blades was reduced by injecting air into the wake from a continuous trailing edge slot. Hollow blades with interior guide vanes create flow channels through which externally supplied air flows from the blade root to the trailing edge. A previous paper documented the substantial tonal reductions of this Trailing Edge Rotor Blowing (TERB) fan. This report documents the broadband characteristics of TERB. The Active Noise Control Fan (ANCF), located at the NASA Glenn Research Center, was used as the proof-of-concept test bed. Two-component hotwire data behind the rotor, unsteady surface pressures on the stator vane, and farfield directivity acoustic data were acquired at blowing rates of 1.1, 1.5, and 1.8 percent of the total fan mass flow. The results indicate a substantial reduction in the rotor wake turbulent velocity and in the stator vane unsteady surface pressures. Based on the physics of the noise generation, these indirect measurements indicate the prospect of broadband noise reduction. However, since the broadband noise generated by the ANCF is rotor-dominated, any change in the rotor-stator interaction broadband noise levels is barely distinguishable in the farfield measurements.
Author
Blowing; Broadband; Low Speed; Noise Reduction; Trailing Edges; Aeroacoustics; Fan Blades; Rotor Blades (Turbomachinery)

20050196723 Duke Univ., Durham, NC, USA
The Impact of Model Uncertainty on Spatial Compensation in Structural Acoustic Control
Clark, Robert L.; [2005]; 17 pp.; In English
Contract(s)/Grant(s): NAG1-01014; 23-781-10-13; No Copyright; Avail: CASI; A03, Hardcopy

Turbulent boundary layer (TBL) noise is considered a primary contribution to the interior noise present in commercial airliners. There are numerous investigations of interior noise control devoted to aircraft panels; however, practical realization is a potential challenge since physical boundary conditions are uncertain at best. In most prior studies, pinned or clamped boundary conditions were assumed; however, realistic panels likely display a range of boundary conditions between these two limits. Uncertainty in boundary conditions is a challenge for control system designers, both in terms of the compensator implemented and the location of transducers required to achieve the desired control. The impact of model uncertainties, specifically uncertain boundaries, on the selection of transducer locations for structural acoustic control is considered herein. The final goal of this work is the design of an aircraft panel structure that can reduce TBL noise transmission through the use of a completely adaptive, single-input, single-output control system. The feasibility of this goal is demonstrated through the

creation of a detailed analytical solution, followed by the implementation of a test model in a transmission loss apparatus. Successfully realizing a control system robust to variations in boundary conditions can lead to the design and implementation of practical adaptive structures that could be used to control the transmission of sound to the interior of aircraft. Results from this research effort indicate it is possible to optimize the design of actuator and sensor location and aperture, minimizing the impact of boundary conditions on the desired structural acoustic control.
Author
Turbulent Boundary Layer; Mathematical Models; Plates (Structural Members); Aerodynamic Noise

20050198846 NASA Glenn Research Center, Cleveland, OH, USA
High-Frequency Focused Water-Coupled Ultrasound Used for Three-Dimensional Surface Depression Profiling
Roth, Don J.; Whalen, Mike F.; Hendricks, J. Lynne; Bodis, James R.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

To interface with other solids, many surfaces are engineered via methods such as plating, coating, and machining to produce a functional surface ensuring successful end products. In addition, subsurface properties such as hardness, residual stress, deformation, chemical composition, and microstructure are often linked to surface characteristics. Surface topography, therefore, contains the signatures of the surface and possibly links to volumetric properties, and as a result serves as a vital link between surface design, manufacturing, and performance. Hence, surface topography can be used to diagnose, monitor, and control fabrication methods. At the NASA Glenn Research Center, the measurement of surface topography is important in developing high-temperature structural materials and for profiling the surface changes of materials during microgravity combustion experiments. A prior study demonstrated that focused air-coupled ultrasound at 1 MHz could profile surfaces with a 25-m depth resolution and a 400-m lateral resolution over a 1.4-mm depth range. In this work, we address the question of whether higher frequency focused water-coupled ultrasound can improve on these specifications. To this end, we employed 10- and 25-MHz focused ultrasonic transducers in the water-coupled mode. The surface profile results seen in this investigation for 25-MHz water-coupled ultrasound, in comparison to those for 1-MHz air-coupled ultrasound, represent an 8 times improvement in depth resolution (3 vs. 25 m seen in practice), an improvement of at least 2 times in lateral resolution (180 vs. 400 m calculated and observed in practice), and an improvement in vertical depth range of 4 times (calculated).
Derived from text
Ultrasonic Wave Transducers; Surface Properties; Acoustic Measurement; Topography

20050198898 NASA Glenn Research Center, Cleveland, OH, USA
The Role of Instability Waves in Predicting Jet Noise
Goldstein, M. E.; Leib, S. J.; March 10, 2004; 65 pp.; In English
Report No.(s): E-14491; Copyright; Avail: CASI; A04, Hardcopy

There has been an ongoing debate about the role of linear instability waves in the prediction of jet noise. Parallel mean flow models, such as the one proposed by Lilley, usually neglect these waves because they cause the solution to become infinite. The resulting solution is then non-causal and can, therefore, be quite different from the true causal solution for the chaotic flows being considered here. The present paper solves the relevant acoustic equations for a non-parallel mean flow by using a vector Green s function approach and assuming the mean flow to be weakly non-parallel, i.e., assuming the spread rate to be small. It demonstrates that linear instability waves must be accounted for in order to construct a proper causal solution to the jet noise problem. . Recent experimental results (e.g., see Tam, Golebiowski, and Seiner,1996) show that the small angle spectra radiated by supersonic jets are quite different from those radiated at larger angles (say, at 90deg) and even exhibit dissimilar frequency scalings (i.e., they scale with Helmholtz number as opposed to Strouhal number). The present solution is (among other things)able to explain this rather puzzling experimental result.
Author
Jet Aircraft Noise; Noise Prediction (Aircraft); Supersonic Jet Flow; Green's Functions; Parallel Flow

20050198963 NASA Glenn Research Center, Cleveland, OH, USA
NASA's Vision for Jet Noise Engineering
Kinzie, Kevin W.; Henderson, Brenda S.; Bridges, James E.; [2004]; 25 pp.; In English; Turbine Engine Technology Symposium 2004, 2 Sep. 2004, Dayton, OH, USA
Contract(s)/Grant(s): WBS 22-781-30-24
Report No.(s): E-14878; No Copyright; Avail: CASI; A03, Hardcopy

Until recently, the design of jet engines for quiet operation was limited by engineers' ability to predict the jet noise

generated by a nozzle exhaust system. More importantly, the 'intermediate steps' between nozzle design and noise had not been understood, limiting the design process to small variations around existing solutions. In recent years NASA's Quiet Aircraft Technology (QAT) Program has advanced the understanding and modeling of jet noise to give engineers the tools they need to design quiet nozzle systems for subsonic exhaust systems. The presentation discusses the approach followed for QAT and argues that a similar effort aimed at supersonic jet exhaust systems will be needed to allow designs of quiet military aircraft in the future.
Author
Jet Aircraft Noise; Exhaust Nozzles; Nozzle Design; Noise Reduction; Noise Prediction (Aircraft); Subsonic Flow; Supersonic Jet Flow; Aeroacoustics

20050199441 NASA Glenn Research Center, Cleveland, OH, USA
Turbofan Noise Studied in Unique Model Research Program in NASA Glenn's 9- by 15-Foot Low-Speed Wind Tunnel
Hughes, Christopher E.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

A comprehensive aeroacoustic research program called the Source Diagnostic Test was recently concluded in NASA Glenn Research Center's 9- by 15-Foot Low Speed Wind Tunnel. The testing involved representatives from Glenn, NASA Langley Research Center, GE Aircraft Engines, and the Boeing Company. The technical objectives of this research were to identify the different source mechanisms of noise in a modern, high-bypass turbofan aircraft engine through scale-model testing and to make detailed acoustic and aerodynamic measurements to more fully understand the physics of how turbofan noise is generated.
Derived from text
Low Speed Wind Tunnels; Aeroacoustics; Jet Aircraft Noise; Acoustic Measurement; Turbofan Engines; Wind Tunnel Tests

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

20050188761 Scuola Normale Superiore, Pisa, Italy
New Frontiers in NanoBiotechnology: Monitoring the Protein Function With Single Protein Resolution
Mar. 2005; 13 pp.; In English
Contract(s)/Grant(s): FA8655-03-1-5054
Report No.(s): AD-A434500; EOARD-CSP-03-5054; No Copyright; Avail: CASI; A03, Hardcopy

This report includes abstracts of papers presented at the ICTP-INFM conference in Trieste, Italy entitled 'New Frontiers in Nanobiotechnology: Monitoring the protein function with single protein solution'. Topics are on the following: protein trafficking, confocal imaging, functionalized atomic force microscopy, optimized optical markers, nonbiotechnology tools, computational methods and application, modelling methods, molecular recognition and docking, fluorescent resonant energy transfer, and other topics of interest.
DTIC
Biotechnology; Nanotechnology; Proteins

20050192481 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Quantum-Dot Focal Plane Array Has Two-Color Capability
Fischer, Anne L.; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 102; In English; Copyright; Avail: Other Sources

Mid- (3 to 5'um) and long-wave (8 to 12 um) infrared focal plane arrays have found a place in numerous security and military applications that require night-vision capability. Single-color detectors have been common, but monolithic two-color devices offer several advantages, such as the ability to detect the absolute temperature map of a scene. Two-color detectors have been demonstrated using mercury cadmium telluride (MCT) and quantum-well detectors. Now a group at the University of New Mexico in Albuquerque - in collaboration with researchers from its start-up company, Zia Laser Inc., the University of Texas at Austin and BAJ3 Systems in Nashua, N.H. - has developed a two-color detector based on quantum dots.
Derived from text
Quantum Dots; Quantum Wells; Focal Plane Devices

20050192487 Laurin Publishing Co., Inc., Pittsfield, MA, USA

Quantum Dots: Small Structures Poised to Break Big

Anscombe, Nadya, Editor; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 94-96; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Imagine a mechanical part that can tell when it is worn out. Or an I ink that is impossible to counterfeit. Or an infrared paint that can help to distinguish friends from enemies using night-vision equipment. These seemingly unconnected applications all are enabled by the use of quantum dots, nanocrystals of semiconductor material with tunable optical properties. Because of recent advances in the manufacturing technology used to produce the dots, the market for the dots seems poised to explode. Companies now can make larger quantities of quantum dots using wet chemistry rather than traditional semiconductor processes such as molecular beam epitaxy or chemical vapor deposition. Called colloidal nanocrystals, the materials are supplied in a liquid suspension or dispersed in plastic composite form. They can be processed from organic or aqueous solution onto substrates that are rigid or flexible, smooth or rough, flat or curved, inorganic or organic. As a result of this adaptability, the quantum dot market is experiencing growth. Among the first-generation products emerging today are quantum dot bioconjugates, which in two years have already made an impact in the life sciences and biomedical areas. Market research company Business Communications Co. Inc. of Norwalk, Conn., estimates current sales of quantum dots to be worth $10 million. By 2009, it forecasts that the market will be approximately $550 million.

Derived from text

Quantum Dots; Nanocrystals

20050196238 New Mexico Univ., Albuquerque, NM USA

Length-Dependence of Intramolecular Electron Transfer in Sigma-Bonded Rigid Molecular Rods: An ab initio Molecular Orbital Study

Pati, Ranjit; Karna, Shashi P.; Jan. 2002; 10 pp.; In English

Report No.(s): AD-A435173; No Copyright; Avail: Defense Technical Information Center (DTIC)

The dependence of electron transfer (ET) coupling element, V?sub AB!, on the length of rigid-rod-like systems consisting of bicyclo1.1.1pentane (BCP), cubane (CUB), and bicyclo2.2.2octane (BCO) monomers, has been investigated with the use of ab initio Hartree-Fock (HF) method employing Marcus-Hush two-state (TS) model. The value of V?sub AB! decreases exponentially with increase in the number of the cage units of the sigma-bonded molecules. The calculated decay constant, beta, shows good agreement with previously reported data. For molecular length \gor=15 AA, the value of V?sub AB! becomes negligibly small, suggesting complete suppression of the through bond direct tunneling contribution to ET process.

DTIC

Chemical Bonds; Electron Transfer; Molecular Orbitals; Rods

20050198902 NASA Glenn Research Center, Cleveland, OH, USA

Entangled Biphoton Virtual-State Spectroscopy of the A(exp 2)Sigma(+) - X(exp 2)Pi System of OH

Kojima, Jun; Nguyen, Quang-Viet; April 27, 2004; 20 pp.; In English

Contract(s)/Grant(s): WBS 22-714-20-05

Report No.(s): E-14661; No Copyright; Avail: CASI; A03, Hardcopy

This Letter describes the first application of entanglement-induced virtual-state spectroscopy to a molecular system. Non-classical, non-monotonic behavior in a two-photon absorption cross section of the OH A-X system, induced by an entangled biphoton state is theoretically demonstrated. A Fourier transform analysis of the biphoton cross section permits access to the energy eigenvalues of intermediate rovibronic states with a fixed excitation photon energy. The dependence of the Fourier spectrum on the tuning range of the entanglement time T(sub e), and the relative path delay tau(sub e) is discussed. Our analysis reveals that the implementation of molecular virtual-state spectroscopy for the OH A-X system requires the tuning of tau(sub e) over a pico-second range with femto-second resolution.

Author

Molecular Spectroscopy; Hydroxyl Radicals; Absorption Cross Sections

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OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20050188642 Emory Univ., Atlanta, GA USA
Multifunctional Magnetic Nanoparticle Probes for Deep-Tissue Imaging
Bao, Gang; Jun. 2005; 8 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0320
Report No.(s): AD-A434280; AFRL-SR-AR-TR-05-0226; No Copyright; Avail: CASI; A02, Hardcopy

The goal of the DARPA-AFOSR project is to develop multifunctional magnetic nanoparticle probes for deep-tissue imaging using MRI. The specific objectives of the Phase 1 project include: (1) to functionalize iron-oxide magnetic nanoparticles for bioconjugation of oligonucleotides and peptides; (2) proof-of-concept demonstration of the signal transduction mechanism based on nanoprobe clustering on mRNA target; (3) to develop peptide-based delivery of magnetic nanoprobes into living cells with high delivery efficiency; (4) to perform preliminary MRI studies of detection sensitivity and signal-to-noise ratio in solution and in cells. This innovative molecular imaging approach integrates in vivo delivery, targeting/sensing and signal transduction; it has the potential to revolutionize medical imaging, diagnosis, and therapeutics with many DoD applications.
DTIC
Imaging Techniques; Magnetic Probes; Magnetic Resonance; Nanoparticles

20050188795 Air Force Research Lab., Wright-Patterson AFB, OH USA
Luminous Efficiency and the Measurement of Daytime Displays, Signals, and Visors
Harrington, Lawrence K.; Bassi, Carl J.; Peck, Carol K.; Jan. 2005; 9 pp.; In English
Contract(s)/Grant(s): Proj-9981
Report No.(s): AD-A434560; No Copyright; Avail: CASI; A02, Hardcopy

Measurements concerning the usability or safety of optical equipment are based on assumptions regarding luminous efficiency. The current luminous efficiency functions are derived from human sensitivity experiments taken at low light levels compared to the outdoor daytime environment. The amount of error induced by extrapolating from low light level data to high light level applications is not known. We sought to determine whether standard luminous efficiency curves CIE V(gamma) and CIE Heterochromatic Brightness Matching are appropriate for measuring day-use optical equipment such as display phosphors, lasers, LEDs and laser eye protection, which are becoming more common in aviation. Methods: Flicker photometry and successive heterochromatic brightness matching were used to measure changes in luminance efficiency functions with increasing levels (1, 10, 100, and 1000 foot-lamberts) of light adaptation. Results: Luminous efficiency increased for longer wavelengths as reference intensity increased. Peak luminous efficiency shifted from approximately 540 nm to greater than 600 nm with increasing intensity. Peak luminous efficiency was constant for flicker photometry across all intensities but the function narrowed slightly at 100 foot-lamberts. Conclusion: Luminous efficiency curves measured at high reference intensities are substantially different from the standard luminous efficiency functions. Caution should be used when measuring spectrally narrow and bright sources such as lasers and LEDs with a V(lambda) corrected photometer because the measured luminance may correlate poorly with perceived brightness.
DTIC
Brightness; Daytime; Display Devices; Luminance; Luminosity; Measurement; Signal Measurement; Visors

20050192484 CVI Laser, Inc., Albuquerque, NM, USA
Understanding Lenses: Aplanats and Achromats
Kubacki, Emily; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 72-75; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Optics terminology can be confusing, but it is critical to be fluent in the language when searching for and specifying optical components. This is especially true for multielement lenses, the two most basic of which are aplanats and achromats. Both typically consist of two or three lens elements, respectively referred to as doublets or triplets. However, they are distinct types of lenses with different applications and different design criteria. Trying to substitute one for the other based solely on price or availability could produce disturbing results.
Author
Lenses; Lens Design; Terminology; Optical Properties

20050192498 Laurin Publishing Co., Inc., Pittsfield, MA, USA
'Slow Light' Demonstrated in Optical Fiber
Burgess, Daniel S.; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 115; In English; Copyright; Avail: Other Sources

A collaboration of researchers from Cornell University in A Ithaca, N.Y., the University of Rochester in New York and Duke University in Durham, N.C., has produced optical delays as long as 20 ns - up to 1.3 times the pulse duration - in conventional single-mode fiber at room temperature. The slow light effect induces delays at telecommunications wavelengths, suggesting potential applications in optical delay lines, buffers and equalizers.
Derived from text
Optical Fibers; Delay Lines; Pulse Duration

20050192622 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Making Light From a Grain of Sand
Fischer, Anne L.; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 99; In English; Original contains color illustrations; Copyright; Avail: Other Sources

LED manufacturers have been working for years to replace the incandescent light. InnovaLight, a start-up in St. Paul, Minn., is using silicon quantum dots in its quest to replace the incandescent bulb with lighting that will last 100 years. The advantages to this nanotech approach, the company's researchers say, include efficiency, stability, color range and low cost. There are no heat issues, and the white light generated is softer than that from LEDs, making it more appropriate for the warm illumination needed in interior environments.
Derived from text
Silicon; Quantum Dots; Light Sources

20050194566 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Actuated Microdisk Is a Wavelength-Selecting Optical Switch
Hitz, Breck; Photonics Spectra; July 2005; Volume 39, Issue 7, pp. 24-28; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Microdisk and microring resonators have been widely studied because they can perform many of the basic functions required in photonic circuits and because they are much smaller than conventional components. In virtually all of the studies to date, however, the coupling between the resonator and its input/output waveguides has been fixed. Recently, researchers at the University of California, Los Angeles, demonstrated a variable coupling scheme. Such a device - a tiny, wavelength-selecting switch - can be used to build tunable optical delays, dynamic dispersion compensators and reconfigurable add/drop multiplexers. The device is a 20-micron-diameter microdisk between two waveguides, fabricated on a silicon-on-insulator wafer. The suspended portions of the waveguides are 0.35 microns wide, 0.6 microns thick and 150 microns long. When a voltage is applied to the electrodes between the waveguides, the waveguides are pulled inward toward the microdisk by electrostatic force. In the absence of a voltage on the electrodes, there is a 1.4-micron gap between the waveguides and the disk, and there is virtually no coupling between them; any light injected into a waveguide passes through the waveguide and exits on the other side. When the waveguides are pulled to within approx. 0.1 micron of the microdisk, almost all the light in the waveguide is evanescently coupled into the disk and transferred to the other waveguide. The gap between the waveguides and the microdisk can be continuously,reduced from 1.4 to 0 microns without any mechanical instability.
Derived from text
Optical Waveguides; Optical Resonators; Optical Switching

20050194725 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Novel Enhancements Demonstrated for Intracavity Nonlinear Optics
Hitz, Breck; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, Issue 7; 3 pp.; In English; Original contains color illustrations; Copyright; Avail: Other Sources

Intracavity nonlinear optics has long been the pathway to additional wavelengths from established lasers. The most common example is the internally doubled neodymium laser in laboratories and hospitals around the world that is being marketed by the tens of thousands as green laser pointers. Recently, a pair of researchers at Lehigh University in Bethlehem, Pa., demonstrated techniques to enhance intracavity nonlinear optics and applied them to build an efficient blue Nd:YAG laser.
Derived from text
Nonlinear Optics; Yag Lasers; Color

20050195861 National Center for Microgravity Research on Fluids and Combustion, Cleveland, OH, USA
Fiber-Optic Imaging Probe Developed for Space Used to Detect Diabetes Through the Eye
Ansari, Rafat R.; Chenault, Michelle V.; Datiles, Manuel B., III; Sebag, J.; Suh, Kwang I.; Research and Technology 1999; March 2000; 4 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Approximately 16 million Americans have diabetes mellitus, which can severely impair eyesight by causing cataracts, diabetic retinopathy, and glaucoma. Cataracts are 1.6 times more common in people with diabetes than in those without diabetes, and cataract extraction is the only surgical treatment. In many cases, diabetes-related ocular pathologies go undiagnosed until visual function is compromised. This ongoing pilot project seeks to study the progression of diabetes in a unique animal model by monitoring changes in the lens with a safe, sensitive, dynamic light-scattering probe. Dynamic light scattering (DLS), has the potential to diagnose cataracts at the molecular level. Recently, a new DLS fiber-optic probe was developed at the NASA Glenn Research Center at Lewis Field for noncontact, accurate, and extremely sensitive particle-sizing measurements in fluid dispersions and suspensions (ref. 1). This compact, portable, and rugged probe is free of optical alignment, offers point-and-shoot operation for various online field applications and challenging environments, and yet is extremely flexible in regards to sample container sizes, materials, and shapes. No external vibration isolation and no index matching are required. It can measure particles as small as 1 nm and as large as few micrometers in a wide concentration range from very dilute (waterlike) dispersions to very turbid (milklike) suspensions. It is safe and fast to use, since it only requires very low laser power (10 nW to 3 mW) with very short data acquisition times (2 to 10 sec).
Derived from text
Fiber Optics; Diabetes Mellitus; Imaging Techniques

20050195889 NASA Glenn Research Center, Cleveland, OH, USA
Flat Lens Focusing Demonstrated With Left-Handed Metamaterial
Wilson, Jeffrey D.; Schwartz, Zachary D.; Chevalier, Christine T.; Downey, Alan N.; Vaden, Karl R.; Research and Technology 2003; May 2004; 3 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Left-handed metamaterials (LHM's) are a new media engineered to possess an effective negative index of refraction over a selected frequency range. This characteristic enables LHM's to exhibit physical properties never before observed. In particular, a negative index of refraction should cause electromagnetic radiation to refract or bend at a negative angle when entering an LHM, as shown in the figure above on the left. The figure on the right shows that this property could be used to bring radiation to a focus with a flat LHM lens. The advantage of a flat lens in comparison to a conventional curved lens is that the focal length could be varied simply by adjusting the distance between the lens and the electromagnetic wave source. In this in-house work, researchers at the NASA Glenn Research Center developed a computational model for LHM's with the three-dimensional electromagnetic commercial code Microwave Studio, constructed an LHM flat lens, and used it to experimentally demonstrate the reversed refraction and flat lens focusing of microwave radiation.
Derived from text
Lenses; Flat Surfaces; Refraction; Focusing

20050196047 EPIR Ltd., Bolingbrook, IL USA
High Performance Long-Wave Infrared (LWIR) HgCdTe on Silicon
Boieriu, Paul; Grein, Chris; Jun. 2005; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W15P7T-05-C-H201
Report No.(s): AD-A434865; No Copyright; Avail: CASI; A03, Hardcopy

It is critical in the field of infrared imaging to reduce focal plane array costs and simultaneously improve their performance. The use of long wavelength infrared HgCdTe grown on Si substrates will reduce array costs, increase their mechanical strength and permit the fabrication of larger area arrays than possible with present-day technology based on bulk CdZnTe substrates.
DTIC
Infrared Imagery; Infrared Radiation; Mercury Cadmium Tellurides; Silicon

20050196241 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Development of a Robust Optical Image Registration Algorithm for Negating Speckle Noise Effects in Coherent Images Generated by a Laser Imaging System
Sabo, Darren R.; Mar. 2005; 95 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435178; AFIT/GE/ENG/05-17; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Air Force Research Laboratory (AFRL) Sensors Directorate has constructed and tested a coherent Light Detection And Ranging (LIDAR) imaging system called Laservision. Registration of individual images remains a significant problem in the generation of useful images collected using coherent imaging systems. Coherent images typically contain significant speckle noise created by the coherency of the laser. Each image collected by the system must be properly registered to allow for averaging the images to produce a single image with adequate resolution to allow detection and identification algorithms to operate accurately or for system operators to perform target detection and identification within a scene. An investigation of the performance of a new image registration algorithm designed using aser speckle noise statistics is conducted on data collected from the Laservision system. This thesis documents the design and performance of the proposed technique compared to that of a standard cross-correlation algorithm. Based on sing only speckle noise statistics, the simulated data test results indicate that there is a small range of low average ignal-to-noise ratios (SNR) where there is the potential to improve the shift estimation error by 0.1 to 0.16 pixels.
DTIC
Algorithms; Coherent Light; Image Processing; Images; Imaging Techniques; Lasers; Pattern Registration

20050196264 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Using Liquid Crystal Spatial Light Modulators for Closed Loop Tracking and Beam Steering With Phase Holograpy
Perry, Michael J.; Mar. 2005; 108 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435223; AFIT/GEO/ENG/05-02; No Copyright; Avail: Defense Technical Information Center (DTIC)

Optical Phased Array (OPA) technology offers advantages in the reduction of size, weight, and power of optical steering devices. Nematic liquid crystal (LC) spatial light modulators (SLMs) have been studied as a potential candidate for building non-mechanical OPAs. They can steer a laser beam and split the beam into multiple beams. This thesis builds upon the prior research showing each split beam can be individually controlled, including variation in intensity. A closed loop tracking scenario shows the flexibility of the SLM by tracking and stabilizing an incoming beam. Results show that applying a phase grating to the SLM has limitations with diffraction and fringing when the SLM is divided into sub-apertures during beam splitting, forcing trade-offs in performance. An iterative Fourier transform algorithm is proposed to overcome the limitations by creating a phase hologram that steers and splits the beam without subdividing the SLM, seeking to minimize the aforementioned effects by allowing more efficient use of the LC array. Results show the beam can be split and steered by a phase hologram and is compared to simulation and the phase grating technique.
DTIC
Beam Steering; Feedback Control; Light Modulators; Liquid Crystals; Optical Communication; Optical Equipment; Phased Arrays

20050196270 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Dynamic Characterization of Thin Deformable PVDF Mirror
Trad, Eric M.; Mar. 2005; 151 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435241; AFIT/GAE/ENY/05-M24; No Copyright; Avail: CASI; A08, Hardcopy

Methodology for the design and fabrication of 5 inch diameter membrane-like mirror structures is explored, resulting in test articles with areal densities as low as 1.57 kg/m2 and a thickness of 1.5 mm. Each optical structure has 7 control patches etched into the PVDF layer, which can be used as actuators. These test articles are utilized to demonstrate the capabilities of an acquisition system to make measurements of static and dynamic actuation of the mirror surface. Static deformations are analyzed statistically and determined to yield maximum deformations in the actuated regions of -2.1 micro with a standard deviation of 0.33 micro when 400 volts are applied. The acquisition system was characterized for dynamic actuation of the surface and found to have a sample rate ranging from 4 to 14 Hz. This rate is found to be dependent upon the desired detail level of the surface description as calculated by the wavefront analysis software.
DTIC
Actuation; Deformable Mirrors; Optical Properties

20050196611 NASA Glenn Research Center, Cleveland, OH, USA
Borescope Imaging System Developed for Luminescent Paint Measurements
Bencic, Timothy J.; Research and Technology 2000; March 2001; 2 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The luminescent paint measurement technique utilizes a coating that is applied to a test article, allowing the air pressure or temperature of a surface to be measured. These coatings are commonly referred to as pressure- or temperature-sensitive

paints. These paints are excited with short wavelength light and emit light at a longer wavelength. By measuring the change of intensity of the emitted light from a known reference condition, researchers can determine the pressure or temperature. The technique of measuring full-field surface pressure and temperatures using luminescent coatings has required a direct line-of-sight from the camera to the surface under study. In most experiments that have used pressure-or temperature-sensitive paints, the test surfaces are mounted so it is straightforward to position the camera and excitation source. In other cases, the luxury of having optical access through a window is not available or even possible. We developed a borescope imaging system to gain optical access in these confined areas. The commercially available 10-mm-diameter rigid borescope contains relay optics to transmit the detected light to a charge-coupled device (CCD) camera as well as an internal fiber-optic light guide to provide the excitation source for the luminescent coatings. The coupled light source can be continuous for the intensity method but also can be pulsed or have a variable intensity for a newer method of acquisition that measures the decay or phase lag of the emitted light. This type of borescope focuses the image directly on the CCD chip without using a fiber-optic relay, eliminating unwanted honeycomb patterns that are typical of fiber-optic type borescopes. This produces images of much higher clarity and uniformity, which are critical for acquiring accurate measurements from the luminescent coatings.
Author
Luminescence; Paints; Endoscopes; Imaging Techniques

20050198936 NASA Glenn Research Center, Cleveland, OH, USA
Wide Angle Liquid Crystal Optical Phased Array
Wang, Xing-Hua; Wang, Bin; Bos, Philip J.; Anderson, James E.; Pouch, John J.; Miranda, Felix A.; McManamon, Paul F.; [2004]; 2 pp.; In English; Optical Society of America Annual Meeting, 10-14 Oct. 2004, Rochester, NY, USA
Contract(s)/Grant(s): WBS 22-319-80-A5
Report No.(s): E-14794; Copyright; Avail: Other Sources

Accurate modeling of a high resolution, liquid crystal (LC) based, optical phased array (OPA) is shown. The simulation shows excellent agreement with a test 2-D LC OPA. The modeling method is extendable to cases where the array element size is close to the wavelength of light. The fringing fields of such a device are first studied, and subsequently reduced. This results in a device that demonstrates plus or minus 7.4 degrees of continuous beam steering at a wavelength of 1550 nm, and a diffraction efficiency (DE) higher than 72%.
Author
Liquid Crystals; Phased Arrays

20050198945 NASA Glenn Research Center, Cleveland, OH, USA
Advanced Optical Technologies in NASA's Space Communication Program: Status, Challenges, and Future Plans
Pouch, John; June 07, 2004; 22 pp.; In English; Great Lakes Photonics Symposium, 7-11 Jun. 2004, Cleveland, OH, USA
Report No.(s): E-14799; No Copyright; Avail: CASI; A03, Hardcopy

A goal of the NASA Space Communications Project is to enable broad coverage for high-data-rate delivery to the users by means of ground, air, and space-based assets. The NASA Enterprise need will be reviewed. A number of optical space communications technologies being developed by NASA will be described, and the prospective applications will be discussed.
Author
Optical Communication; Space Communication

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20050188767 Air Force Research Lab., Hanscom AFB, MA USA
Observed and Simulated Depletion Layers with Southward IMF
Maynard, N. C.; Burke, W. J.; Scudder, J. D.; Ober, D. M.; Siscoe, G. L.; White, W. W.; Siebert, K. D.; Weimer, D. R.; Erickson, G. M.; Schoendorf, J.; Jun. 2004; 20 pp.; In English
Contract(s)/Grant(s): NAG5-8135; NASW-99014; Proj-2311
Report No.(s): AD-A434523; AFRL-VS-HA-TR-2005-1060; No Copyright; Avail: CASI; A03, Hardcopy

We present observations from the Polar satellite that confirm the existence of two types of depletion layers predicted under southward interplanetary magnetic field (IMF) conditions in magnetohydrodynamic simulations. The first depletion type

occurs along the stagnation line when IMF B(X) and/or dipole tilt are/is present. Magnetic merging occurred away from the equator (maynard, et al. , 2003) and flux pile-ups developed while the field lines drape to the high-latitude merging sites. This high-shear type of depletion is consistent with the depletion layer model suggested by Zwan and Wolf (1976) for low-shear northward IMF conditions.
DTIC
Depletion; Interplanetary Magnetic Fields; Magnetohydrodynamics

20050194653 Lawrence Livermore National Lab., Livermore, CA USA
Effects of the Electron Energy Distribution Function on Line and Continuum Emission
Hansen, S. B.; Shlyaptseva, A. S.; Apr. 15, 2004; 16 pp.; In English
Report No.(s): DE2005-15014039; UCRL-CONF-203582; No Copyright; Avail: Department of Energy Information Bridge
Effects of suprathermal (hot) electrons on the predictions of K- and L-shell non-LTE collisional-radiative atomic kinetics models are presented through an investigation of various electron distribution functions (EDFs) on collisional rates and spectra. It is shown that while most collisional rates are fairly insensitive to the functional form and characteristic energy of the hot electrons as long as their characteristic energy is larger than the threshold energy for the collisional process, collisional excitation and ionization rates are highly sensitive to the fraction of hot electrons. This permits the development of robust spectroscopic diagnostics that can be used to detect the presence of hot electrons from x-ray line emission spectra. Hot electrons are shown to increase and spread out plasma charge state distributions, amplify the intensities of emission lines fed by direct collisional excitation and radiative cascades, and alter the structure of satellite and EUV line emission features.
NTIS
Continuums; Distribution Functions; Electron Energy; Plasma Diagnostics

20050194714 Lawrence Livermore National Lab., Livermore, CA USA
Filter-Fluorescer Diagnostic System (FFLEX) for the National Ignition Facility (NIF)
McDonald, J. W.; Kauffman, R. L.; Celeste, J. R.; Rhodes, M. A.; Lee, F. D.; Apr. 30, 2004; 10 pp.; In English
Report No.(s): DE2005-15014753; UCRL-CONF-203918; No Copyright; Avail: Department of Energy Information Bridge
An early Filter-Fluorescer Diagnostic System (FFLEX) is being fielded at the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL) to measure the amount of hard x-rays (20 \h hv \h 150 keV) generated in laser fusion experiments. From these measurements we hope to quantify the number of hot (20 to 50 keV) electrons produced in laser fusion experiments. The Measurement of hot electron production is important for ignition experiments because these electrons can preheat the fuel capsule. Hot electrons can also be employed in experimentation by preheating hydrodynamic packages or by driving plasmas out of equilibrium. The experimental apparatus, data collection, analysis and calibration issues are discussed. Expected data signal levels and rates are predicted and discussed.
NTIS
Ignition; Plasma Diagnostics

20050196752 Wisconsin Univ., Madison, WI, USA
Annual Progress Report on TFTR Experimental Data Analysis Collaboration
Callen, J. D.; Jun. 1994; 18 pp.; In English
Report No.(s): DE2005-837071; No Copyright; Avail: Department of Energy Information Bridge
The research performed during the third year of this grant concentrated on a few key TFTR experimental data analysis issues: (1) characterization of MHD mode activity in TFTR; (2) comparison of low mode number MHD modes with neoclassical MHD theory; (3) further developments in local electron heat transient transport measurements; and (4) some other topics. Emphasis is placed on differences in these characteristics in DT and DD plasmas
NTIS
Data Processing; Data Reduction; Fusion Reactors; Magnetohydrodynamics; Tokamak Devices

20050196774 Lawrence Livermore National Lab., Livermore, CA USA
K-Alpha Emission Spectra From Non-Equilibrium Ionizing Plasmas
Jacobs, V. L.; Decaux, V.; Beiersdorfer, P.; Dec. 17, 2004; 12 pp.; In English
Report No.(s): DE2005-15014530; UCRL-PROC-208688; No Copyright; Avail: Department of Energy Information Bridge
K-alpha x-ray emission spectra from highly charged Fe ions have been theoretically predicted using a detailed and systematic spectral model. Account has been taken of the fundamental atomic radiative-emission processes associated with

inner-shell electron collisional excitation and ionization, as well as dielectronic recombination. Particular emphasis has been directed at extreme non-equilibrium or transient-ionization conditions, which can occur in astrophysical and tokamak plasmas. Good agreement has been found in comparisons with spectral observations on the EBIT-II electron beam ion trap at the Lawrence Livermore National Laboratory. We have identified spectral features that can serve as diagnostics of the electron density, the line-formation mechanism, and the charge-state distribution.
NTIS
Alpha Particles; Autoionization; Emission Spectra; Plasma Equilibrium; Radiation Spectra

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SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20050192485 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Quantum Dots and Quantum Wells Go Head-to-Head
Burgess, Daniel S.; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7; 2 pp.; In English; Copyright; Avail: Other Sources

In the pursuit of more efficient GaAs-based emitters for telecommunications applications, researchers at Laboratorio Nazionale TASC-INFM and the University of Trieste, both in Italy, have performed a comparison of the photoluminescence of InAsN quantum dots and InGaAsN/GaAs quantum wells produced in the same molecular beam epitaxy reactor. Their work indicates that quantum dots display higher thermal stability than quantum wells, and that the use of GaAsN rather than GaAs barriers with the dots yields more intense and narrower luminescence.
Derived from text
Gallium Arsenides; Quantum Dots; Quantum Wells

20050192489 Laurin Publishing Co., Inc., Pittsfield, MA, USA
How Can Quantum Dots Be Used?
Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, No. 7, pp. 98; In English; Copyright; Avail: Other Sources

Quantum dots are so versatile that most of their applications have not yet been realized. A few in development are: Solar cells. Solar cells made from silicon can be stable and efficient, but they are expensive to make. Solar cells that employ organic semiconductors are less expensive but suffer from poor efficiency. Quantum dots can be used to make solar cells by combining colloidal dots with organic semiconductors. The dots improve the efficiency of these devices and enable the manufacturer to control their absorptive properties. The quantum dots can be formed into an ordered 3-D array with interdot spacing that is small enough for strong electronic coupling, and minibands form that allow long-range electron transport. This increases the likelihood that each photon impinging on the cell will cause electricity to flow, increasing the voltage. Quantum dots also can produce impact ionization, where one energetic carrier can split into two, increasing the current.
Derived from text
Electric Potential; Organic Semiconductors; Quantum Dots; Silicon

20050194576 Laurin Publishing Co., Inc., Pittsfield, MA, USA
Painting Nanowires Yields High-speed Circuits
Fischer, Anne L.; Photonics Spectra; July 2005; ISSN 0731-1230; Volume 39, Issue 7, pp. 107-108; In English; Original contains color illustrations; Copyright; Avail: Other Sources

The production of circuits and processors from silicon substrates is expensive, and the required high-temperature fabrication process is not always compatible with a variety of materials. Researchers at Harvard University in Cambridge, Mass., have found an alternative: using nanowires to create electronic devices on glass and plastic from a solution. The technique eliminates the need for high temperatures in the production process.
Derived from text
Nanowires; Integrated Circuits; Semiconducting Films; Oscillators

20050195886 NASA Glenn Research Center, Cleveland, OH, USA, Analex Corp., USA

Silicon-Germanium Films Grown on Sapphire for Ka-Band Communications Applications

Alterovitz, Samuel A.; Mueller, Carl H.; Croke, Edward T.; Research and Technology 2003; May 2004; 2 pp.; In English; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

NASA's vision in the space communications area is to develop a broadband data network in which there is a high degree of interconnectivity among the various satellite systems, ground stations, and wired systems. To accomplish this goal, we will need complex electronic circuits integrating analog and digital data handling at the Ka-band (26 to 40 GHz). The purpose of this project is to show the feasibility of a new technology for Ka-band communications applications, namely silicon germanium (SiGe) on sapphire. This new technology will have several advantages in comparison to the existing silicon-substrate- based circuits. The main advantages are extremely low parasitic reactances that enable much higher quality active and passive components, better device isolation, higher radiation tolerance, and the integration of digital and analog circuitry on a single chip.

Derived from text

Silicon Films; Germanium; Metal Films; Sapphire; Data Bases; Networks

20050196769 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, Old Dominion Univ., Norfolk, VA, USA

Measurements of the High Field Q-Drop in TE(sub 011)/TM(sub 010) Mode in a Single Cell Cavity

Ciovati, G.; Kneisel, P.; January 2005; 14 pp.; In English

Report No.(s): DE2005-834957; No Copyright; Avail: Department of Energy Information Bridge

In the last few years superconducting radio-frequency cavities made of high purity (RRR\g200) niobium achieved accelerating gradients close to the theoretical limits. An obstacle towards reproducibly achieve higher fields is represented by some anomalous losses causing a sharp degradation of the cavity quality factor when the peak surface magnetic field is above about 90 mT, in the absence of field emission. This effect, called Q-drop has been measured in many laboratories on single- and multi-cell cavities mainly in the gigahertz range. In order to gain some understanding of the nature of these losses, a CEBAF single cell cavity has been tested in the TM010 and TE011 modes at 2 K. The feature of the TE011 mode is to have zero electric field on the cavity surface, allowing to exclude any electric field effect on the Q-drop. This paper will present some of the experimental results for different cavity treatments and will compare them with existing models for the Q-drop.

NTIS

Cavities; Particle Accelerators; Q Factors; Superconducting Cavity Resonators

20050196785 Tel-Aviv Univ., Ramat-Aviv, Tel-Aviv, Israel, Pennsylvania State Univ., University Park, PA, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA, Saint Petersburg Nuclear Physics Inst., Gatchina, Russia

Transverse Structure of Strong Interactions at LHC: From Diffraction to New Particle Production

Frankfurt, L.; Strikman, M.; Weiss, C.; Zhalov, M.; January 2004; 16 pp.; In English

Report No.(s): DE2005-835126; No Copyright; Avail: Department of Energy Information Bridge

We discuss the global structure of pp events at LHC with hard processes (particle production in two-parton collisions) on the basis of the transverse spatial characteristics of the partonic initial state. Studies of hard exclusive processes in ep scattering have shown that the transverse area occupied by partons with x glt 10(sup -2) is much smaller than the size of the nucleon as it appears in generic inelastic pp collisions at high energies (two-scale picture). We show that this is consistent with the observation that the elastic pp amplitude at the Tevatron energy is close to the black body limit at small impact parameters. Our picture implies that inclusive heavy particle production (Higgs, SUSY) happens only in central pp collisions. At LHC energies, the final state characteristics of such events are strongly influenced by the approach to the black body limit, and thus may differ substantially from what one expects based on the extrapolation of Tevatron results. Our two-scale picture also allows us to analyze several types of hard diffractive processes observable at LHC: (1) Diffractive proton dissociation into three jets, which probes small-size configurations in the proton wave function; (2) exclusive diffractive Higgs production, in which we estimate the rapidity gap survival probability; (3) inclusive diffractive processes.

NTIS

Diffraction; Particle Production; Particle Accelerators; Particle Collisions

20050198901 NASA Glenn Research Center, Cleveland, OH, USA

Sintering of BaCe(sub 0.85)Y(sub 0.15)O(sub 3-delta) with/without SrTiO3 Dopant

Dynys, F.; Sayir, A.; Heimann, P. J.; [2004]; 6 pp.; In English; American Ceramic Society 28th International Cocoa Beach Conference, 25-30 Jan. 2004, Cocoa Beach, FL, USA

Contract(s)/Grant(s): NCC3-850; 22-274-00-03-04

Report No.(s): E-14605; No Copyright; Avail: CASI; A02, Hardcopy

The perovskite composition, BaCe(sub 0.85)Y(sub 0.15)O(sub 3-delta), displays excellent protonic conduction at high temperatures making it a desirable candidate for hydrogen separation membranes. This paper reports on the sintering behavior of BaCe(sub 0.85)Y(sub 0.15)O(sub 3-delta) powders doped with SrTiO3. Two methods were used to synthesize BaCe(sub 0.85)Y(sub 0.15)O(sub 3-delta) powders: (1) solid state reaction and (2) wet chemical co-precipitation. Co-precipitated powder crystallized into the perovskite phase at 1000 C for 4 hrs. Complete reaction and crystallization of the perovskite phase by solid state was achieved by calcining at 1200 C for 24 hrs. Solid state synthesis produced a coarser powder with an average particle size of 1.3 microns and surface area of 0.74 sq m/g. Co-precipitation produced a finer powder with a average particle size of 65 nm and surface area of 14.9 sq m/g. Powders were doped with 1, 2, 5, and 10 mole % SrTiO3. Samples were sintered at 1450 C, 1550 C and 1650 C. SrTiO3 enhances sintering, optimal dopant level is different for powders synthesized by solid state and co-precipitation. Both powders exhibit similar grain growth behavior. Dopant levels of 5 and 10 mole % SrTiO3 significantly enhances the grain size.

Author

Perovskites; Sintering; Hydrogen Production; Barium Compounds; Strontium Titanates; Doping (Materials)

20050199443 NASA Glenn Research Center, Cleveland, OH, USA

Coarsening Experiment Being Prepared for Flight

Hickman, J. Mark; Research and Technology 2000; March 2001; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The Coarsening in Solid-Liquid Mixtures-2 (CSLM-2) experiment is a materials science space flight experiment whose purpose is to investigate the kinetics of competitive particle growth within a liquid matrix. During coarsening, small particles shrink by losing atoms to larger particles, causing the larger particles to grow. In this experiment, solid particles of tin will grow (coarsen) within a liquid lead-tin eutectic matrix. The preceding figures show the coarsening of tin particles in a lead-tin eutectic as a function of time. By conducting this experiment in a microgravity environment, we can study a greater range of solid volume fractions, and the effects of sedimentation present in terrestrial experiments will be negligible. The CSLM-2 experiment is slated to fly onboard the International Space Station. The experiment will be run in the Microgravity Science Glovebox installed in the U.S. Laboratory module.

Derived from text

Microgravity; Eutectics; Liquid-Solid Interfaces; Spaceborne Experiments; Coarseness

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics*, and *25 Inorganic, Organic and Physical Chemistry*.

20050192647 Lawrence Livermore National Lab., Livermore, CA USA

Neutron Sensor Based on Synthetic Single Crystal Diamond

Schmid, G. J.; Izumi, N.; Moran, M. J.; Koch, J. A.; Phillips, T. W.; Oct. 21, 2003; 32 pp.; In English

Report No.(s): DE2005-15013804; UCRL-CONF-200447; No Copyright; Avail: Department of Energy Information Bridge

We report the first neutron data for a single crystal Chemical Vapor Deposition (CVD) diamond sensor. Results are presented for 2.5, 14.1, and 14.9 MeV incident neutrons. We show that the energy resolution for 14.1 MeV neutrons is at least 2.9% (as limited by the energy spread of the incident neutrons), and perhaps as good as 0.4% (as extrapolated from high resolution particle data). This result could be relevant to fusion neutron spectroscopy at machines like the International Thermonuclear Experimental Reactor (ITER). We also show that our sensor has a high neutron linear attenuation coefficient, due to the high atomic density of diamond, and this could lead to applications in fission neutron detection.

NTIS

Diamonds; Neutrons; Single Crystals; Vapor Deposition

20050195855 Lawrence Livermore National Lab., Livermore, CA USA
Approximate Thermodynamics States Relations in Partially Ionized Gas Mixtures
Ramshaw, J. D.; Dec. 30, 2003; 28 pp.; In English
Report No.(s): DE2005-15013878; UCRL-TR-201648; No Copyright; Avail: Department of Energy Information Bridge

Multicomponent hydrodynamics calculations require thermodynamic state relations for material mixtures. Unfortunately, it is rarely feasible to construct accurate state relations for multicomponent atomic mixtures of interacting materials, and even less feasible to employ them in practice. In lieu of this, it is necessary to approximate the state relations of the mixture in terms of those of the pure materials of which it is composed. The question then arises of how to construct the best or most accurate approximations of this type.

NTIS
Gas Mixtures; Ionized Gases; Thermodynamics

20050196063 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Thermal Characteristics of Pitch Based Carbon Foam and Phase Change Materials
Wierschke, Kevin W.; Mar. 2005; 76 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434895; AFIT/GSS/ENY/05-M05; No Copyright; Avail: Defense Technical Information Center (DTIC)

Phase-change thermal energy storage devices offer thermal control systems an option that allows a smaller heat sink to be used by absorbing the thermal energy quickly and storing it in the phase change to prevent failure of electronic components and then slowly releasing the heat to the heat sink. This paper experimentally determined the transient response of carbon foam with a phase-change material by measuring the response to a step temperature input to test samples. The transient response was recorded until steady state was reached. An analytic response was created and compared against the measured response. A simplified analytic prediction of the transient response was developed by using an energy balance. This approximation was then compared against the experimental results.

DTIC
Carbon; Foams; Phase Change Materials; Temperature Control; Thermodynamic Properties

20050196150 Naval Research Lab., Washington, DC USA
A New Ontological View of the Quantum Measurement Problem
Zhang, Xiaolei; Jun. 2005; 39 pp.; In English
Report No.(s): AD-A435032; NRL/MR/7218--05-8883; No Copyright; Avail: Defense Technical Information Center (DTIC)

A new ontological view of the quantum measurement processes is given, which has bearings on many broader issues in the foundations of quantum mechanics as well. In this scenario, a quantum measurement is a nonequilibrium phase transition in a 'resonant cavity' formed by the entire physical universe including all of its material and energy content. A quantum measurement involves the energy and matter exchange among not only the system being measured and the measuring apparatus but also the global environment of the universe resonant cavity, which together constrain the nature of the phase transition.

DTIC
Quantum Mechanics; Quantum Theory

20050196230 Dayton Univ. Research Inst., OH USA
Refueling Tanker Truck Temperature Measurements
Williams, Theodore F.; Vangsness, Marlin D.; Shardo, James R.; Ervin, Jamie S.; Feb. 2005; 29 pp.; In English
Contract(s)/Grant(s): F33615-03-2-2347; Proj-3048
Report No.(s): AD-A435147; AFRL-PR-WP-TR-2005-2103; No Copyright; Avail: Defense Technical Information Center (DTIC)

In support of efforts involving thermal management studies, an instrumentation package was assembled to monitor the temperature of refueling tank trucks (specifically for the Oshkosh Rl1 refueling truck). As part of the program, two trucks were temporarily instrumented at two Air Force bases to log temperatures over a period of 1 to 4 weeks. The first instrumentation installation was performed at WPAFB and the data acquisition covered a 6-day period from June 6th to June 23rd. The second instrumentation package was installed at Nellis AFB and the data acquisition covered a 4-week period from July 13th to August 13th. The maximum measured temperatures occurred at Nellis AFB in late July (tanker skin; 168 F, air space above

the fuel; 136 F, fuel; 112 F). The data taken was also used to validate a two-dimensional computer model.
DTIC
Fuel Tanks; Refueling; Temperature Control; Temperature Measurement; Trucks

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

20050192480 George Washington Univ., Washington, DC, USA
Aeroacoustics Research Program
Myers, Michael K.; Posey, Joe W., Technical Monitor; [2005]; 3 pp.; In English
Contract(s)/Grant(s): NCC1-03003; No Copyright; Avail: CASI; A01, Hardcopy

Since its inception in January 2003, the program has provided support for 1 faculty and 1 graduate student researcher. One Graduate Research Scholar Assistant was partially supported by this award. One student has completed his M.S. degree program and 1 has nearly completed the D.Sc. degree program (expected completion Fall 2005). The program has generated 1 D.Sc. dissertation. 1 M.S. theses and 2 publications.
Derived from text
Aeroacoustics; Education; NASA Programs

20050192499 George Washington Univ., Hampton, VA, USA
A Research Program in Flight Sciences
Whitesides, John L.; Waggoner, Edgar G., Technical Monitor; [2005]; 4 pp.; In English
Contract(s)/Grant(s): NCC1-03025; No Copyright; Avail: CASI; A01, Hardcopy

Since its inception in January 2003, thc program has provided support for 1 faculty and a total of 7 Graduate Research Scholar Assistants, of these all 7 have completed their MS degree program. The program has generated 5 MS thesis and 2 MS project reports. Attachment: Appendix A, B, C, and D.
Derived from text
Education; Flight Mechanics

20050192547 Steering Committee for Southern Africa, Mowbray, South Africa
AFREF: Southern and East African Components
Wonnakott, R.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 235-238; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

There are over 50 countries in Africa practically all of which are considered as developing nations and each with its own difficulties and challenges. With each country having its own geodetic reference system, one of these challenges as a continent lies in the inability of African countries to plan meaningful and cohesive development projects which rely heavily on a sound and uniform continental geodetic reference frame. Such a framework will be used to develop uniform mapping programmes, monitor a variety of environmental changes, provide a consistent navigational reference system and provide a common reference frame to resolve international boundary disputes. The African Geodetic Reference Frame (AFREF) is conceived, therefore, as a unified geodetic reference frame for Africa. It will be the fundamental basis for the national three-dimensional reference networks fully consistent and homogeneous with the International Terrestrial Reference Frame (ITRF). When fully implemented, its backbone will consist of a network of continuous, permanent GPS stations such that a user anywhere in Africa would have free access to and would be, at most, 1000km from such stations. Full implementation will include a unified vertical datum and support for efforts to establish a precise African geoid, in concert with the African Geoid project activities.
Derived from text
Cohesion; Coordination; Geodesy; Global Positioning System; International Cooperation

20050192602 Supreme Allied Commander Atlantic, Norfolk, VA, USA
Modeling and Simulation Requirements for Transformation Activities
Wright, Colin D.; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004; 31 pp.; In English; See also 20050192588; Original contains color and black and white illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Contents include the following: Examples of transformation need M&S support. Mission Analysis, Strategic Concepts. Operational Concepts. Long Term Capability Requirements. Developing Solutions (CDE, R&T, CNAD). Education, Training, Exercises. Support to Operations. Implications for M&S Capabilities. Examples of transformation activities that need M&S support. Mission Analysis, Strategic Concepts. Operational Concepts. Long Term Capability Requirements. Way Ahead.
CASI
Mission Planning; Mathematical Models

20050193448 NASA, Washington, DC, USA
ASK Magazine; No. 21
Laufer, Alexander, Editor; Little, Terry, Editor; Davis, Marty, Editor; Simmons, Jessica, Editor; Margolies, Donald, Editor; Goshorn, Larry, Editor; Spring 2005; 51 pp.; In English; See also 20050193449 - 20050193461; Original contains color and black and white illustrations
Report No.(s): NASA/NP-2005-05-404-HQ; No Copyright; Avail: CASI; A04, Hardcopy

THIS ISSUE FEATURES A VISUAL DEPICTION of THE ACADEMY of Program and Project Leadership (APPL). I imagine a variety of initial reactions to the drawing. One might be, 'What is a cartoon doing in a magazine about project management?' Or perhaps, 'Wow, nice colors-and fun.' Another may be to closely search the image for signs, symbols and meaning. Still another, to read a new level of innovation and creativity into the picture. Undoubtedly, some readers will raise questions about the cost. Of course, any reaction is a sign of engagement. The stronger, the more energized the emotional and cognitive processing, the better. It is a sign of attention and interaction. For I've heard it said, 'You only need to worry if they don t care one way or the other.' So what is the point of the picture? To stimulate interest, raise questions, promote discussion, and maybe raise a smile.. .That, at least, was my initial reaction when I was introduced to the work of Nancy Hegedus, who helps to create these drawings for Root Learning Inc. At the NASA PM Conference, I was first shown the work Nancy had been doing with the help of Goddard s Knowledge Management Architect, Dr. Ed Rogers. I was immediately drawn into the power of visualization as a tool for more effective learning, communicating, and conveying complex knowledge concepts. We need new tools in today s world, where information and data overwhelms by sheer volume. There are articles, pamphlets, communications, and white papers-all aiming to convince and influence. Reactions to these tend to be either avoidance or mind-numbing, heavy-eyed consent; the message never registers or enters the soul. That s one of the reasons that APPL s Knowledge Sharing Initiative (KSI) has turned to storytelling as a memorable way of transfer- ring knowledge, inspiring imitation of best practices, and spurring reflection. ASK Magazine s recent fourth birthday marks an important milestone in APPL s continuing quest to provide ongoing support to project managers and to promote mission success. And similar to storytelling, the power of visualization is receiving increasing attention in recent years as a way to stimulate engagement. Pictures and visual graphs are viewed as one of the most effective ways for displaying, describing, and generating discussion about quantitative and technically complex information. Prototypes, models, and simulations are considered essential for stimulating innovation through open and engaging discussions. There has also been extensive writing on the use of visual graphics, pictures, and cartoons to facilitate memory, creativity, openness, attention-and even well-being. For many of these reasons, I am excited to have a colorful visual depiction of the APPL world included in ASK. Without the addition of text or slides, the intent is to invite people into the world of the APPL mission-as well as its products, services, customers, and partners- in a fun and engaging manner. As project leaders strive to find ways to encourage engagement, learning, and transmission of knowledge, traditional technologies are proving to be as valuable as modern technologies. (But for those who want more information in the form of texts and slide presentations, we certainly have an abundance of those as well.)
Derived from text
Communicating; Leadership; Conferences; Procedures; Visual Perception; Stimulation

20050193449 Lean Construction Inst., Ketchum, ID, USA
Keeping Promises
Howell, Gregory A.; ASK Magazine; No. 21; Spring 2005, pp. 33-34; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Commitments are between people, not schedules. Project management as practiced today creates a 'commitment-free zone,' because it assumes that people will commit to centrally managed schedules without providing a mechanism to ensure

their work can be done. So they give it their best, but something always seems to come up ...'I tried, but you know how it is.' This form of project management does not provide a mechanism to ensure that what should be done, can in fact be done at the required moment. Too often, promises reliable promise. made in coordination meetings are conditional and unreliable. It has been my experience that at times trust can be low and hard to build in this environment. The absence of reliable promises explains why on well-run projects, people are often only completing 30-50 percent of the deliverables they d promised for the week. We all know what a promise is; we have plenty of experience making them and receiving them from others. So what s the problem? The sad fact is that the project environment-like many other work environments- is often so filled with systemic dishonesty, that we don t expect promises that are reliable. Project managers excel when they manage their projects as networks of commitments and help their people learn to elicit and make reliable promises.
Derived from text
Project Management; Coordination; Delivery

20050193451 NASA Ames Research Center, Moffett Field, CA, USA
Establishing a Presence
McCandless, Jeffrey; ASK Magazine; No. 21; Spring 2005, pp. 10-11; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The basis for this successful collaboration was face-to-face communication. Though it was sometimes stressful being on the road so much, I really learned the importance of being present to work together and ask questions in person. Another measure of success was that in the midst of this project and traveling, my wife and I managed to start a family. My oldest boy got a real kick out of visiting Space Center Houston when he was two to learn all about the 'face futtle' which goes way up in the sky. When practical, collocation and face-to-face communication on a project eliminate misunderstandings, establish relationships, make information more easily accessible, and promote a team atmosphere. Compromise is key to balancing both family and career goals. Knowing when to prioritize each is important to success in both aspects.
Derived from text
Collocation; Occupation; Balancing

20050195876 NASA Glenn Research Center, Cleveland, OH, USA
EngineSim: Turbojet Engine Simulator Adapted for High School Classroom Use
Petersen, Ruth A.; Research and Technology 2000; March 2001; 3 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

EngineSim is an interactive educational computer program that allows users to explore the effect of engine operation on total aircraft performance. The software is supported by a basic propulsion web site called the Beginner's Guide to Propulsion, which includes educator-created, web-based activities for the classroom use of EngineSim. In addition, educators can schedule videoconferencing workshops in which EngineSim's creator demonstrates the software and discusses its use in the educational setting. This software is a product of NASA Glenn Research Center's Learning Technologies Project, an educational outreach initiative within the High Performance Computing and Communications Program.
Derived from text
Education; Turbojet Engines; NASA Programs

20050196698 Hawaii Univ., Honolulu, HI, USA
Hawaii Space Grant Consortium
Flynn, Luke P.; [2005]; 31 pp.; In English
Contract(s)/Grant(s): NGT5-40076; No Copyright; Avail: CASI; A03, Hardcopy

The Hawai'i Space Grant Consortium is composed of ten institutions of higher learning including the University of Hawai'i at Manoa, the University of Hawai'i at Hilo, the University of Guam, and seven Community Colleges spread over the 4 main Hawaiian islands. Geographic separation is not the only obstacle that we face as a Consortium. Hawai'i has been mired in an economic downturn due to a lack of tourism for almost all of the period (2001 - 2004) covered by this report, although hotel occupancy rates and real estate sales have sky-rocketed in the last year. Our challenges have been many including providing quality educational opportunities in the face of shrinking State and Federal budgets, encouraging science and technology course instruction at the K-12 level in a public school system that is becoming less focused on high technology and more focused on developing basic reading and math skills, and assembling community college programs with instructors who are expected to teach more classes for the same salary. Motivated people can overcome these problems. Fortunately, the Hawai'i Space Grant Consortium (HSGC) consists of a group of highly motivated and talented individuals who have not only

overcome these obstacles, but have excelled with the Program. We fill a critical need within the State of Hawai'i to provide our children with opportunities to pursue their dreams of becoming the next generation of NASA astronauts, engineers, and explorers. Our strength lies not only in our diligent and creative HSGC advisory board, but also with Hawai'i's teachers, students, parents, and industry executives who are willing to invest their time, effort, and resources into Hawai'i's future. Our operational philosophy is to FACE the Future, meaning that we will facilitate, administer, catalyze, and educate in order to achieve our objective of creating a highly technically capable workforce both here in Hawai'i and for NASA. In addition to administering to programs and educating the public in the traditional sense, we also work to facilitate partnerships between other departments (geology & geophysics, engineering, geography, astronomy), state and federal government agencies in Hawai'i, and private industry. In some cases, we are the catalyst for new partnerships between private agency sponsors and education projects or for new joint research and education projects between industry and the University faculty.
Derived from text
Education; Hawaii; Organizations; NASA Programs; University Program

20050198880 George Washington Univ., Hampton, VA, USA
Program of Research and Education in Aerospace Structures
Whitesides, John L.; Johansen, Laurie W.; [2005]; 5 pp.; In English
Contract(s)/Grant(s): NCC1-03008; No Copyright; Avail: CASI; A01, Hardcopy

Since its inception in January 2003, the program has provided support for 1 research professor and a total of 10 Graduate Research Scholar Assistants of these all 10 have completed their MS degree program. The program has generated 10 MS thesis. Final report lists papers presented in seminars for the period January 1, 2003 through June 30, 2005.
Derived from text
Education; Research; Aircraft Structures; NASA Programs

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20050192482 Technological Research and Development Authority, USA
Space Alliance Technology Outreach Program
July 2005; 4 pp.; In English
Contract(s)/Grant(s): NAG5-11980; No Copyright; Avail: CASI; A01, Hardcopy

Space Alliance Technology Outreach Program (SATOP), will provide technical assistance to small businesses through the contribution of time and expertise from Space Alliance Partners and support the development and expansion of technology business incubation programs in Florida and New York. A summary of these accomplishments are given.
CASI
Commerce; Aerospace Engineering

20050192534 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Central Bureau Status and Perspective
Neilan, Ruth; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 7-8; In English; See also 20050192500; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Central Bureau continues to promote the IGS organization, data and data products as setting the world standard for GPS/GNSS geodetic applications as outlined in the IGS Strategic Plan. The Central Bureau was responsible for the organization of the strategic planning process, preparation of all documents, and the editing and publication of the plan. This was a major activity and the Board s consensus on the plan is a significant milestone in the evolution of the IGS. The Central Bureau is responsible for the day-to-day management of the Service. With 200 organizations in over 80 countries and a ground network of approx. 350 stations, this requires daily interfaces on many different levels globally. The separate summary of the IGS Network Coordinator is included in this annual report and demonstrates the vital technical tasks of the Central Bureau. The CB is also responsible to arrange and organize all Board activities and is involved in the supporting the planning and logistics of all IGS workshops and meetings.
Derived from text
Global Positioning System; Management Planning; Standards

20050192588 Research and Technology Organization, Neuilly-sur-Seine, France

Modelling and Simulation to Address NATO's New and Existing Military Requirements

October 2004; 272 pp.; In English; NATO RTO Modelling and Simulation Conference, 7-8 Oct. 2004, Koblenz, Germany; See also 20050192589 - 20050192610

Report No.(s): RTO-MP-MSG-028; AC/323(MSG-028)TP/15; Copyright; Avail: CASI; C01, CD-ROM; A12, Hardcopy

NATO is in the process of radical change through the NATO Transformation process and the development of new military requirements without neglected the existing ones. From a broad NATO perspective, the emphasis is on collaborative efforts to improve joint, combined capabilities. Two strategic commands, one operational (Allied Command Operations, ACO, located in Brussels, Belgium), and one functional (Allied Command Transformation, ACT, located in Norfolk, Virginia, USA) have been recently established. The second, functional strategic command ACT is responsible for the continuing transformation of military capabilities and for promoting interoperability of proposed implementations. Modelling and Simulation (M&S) has been recognized within NATO as a key element in addressing these new requirements and challenges of the NATO Transformation process. This year s conference was planned to focus on the ways in which Modelling and Simulation can address these new requirements and challenges and assist in the NATO Transformation process without neglecting the existing military requirements. To this end, the conference was designed to provide attendees a forum to advance M&S in the Alliance. The combination of M&S users and developers concentrated in this one forum educated attendees, and also provided fresh ideas for the furtherance of NATO M&S in addressing NATO s New and Existing Military Requirements.

Derived from text

Interoperability; Simulation; Military Operations; User Requirements

20050192590 Bundesamt fuer Wehrtechnik und Beschaffung, Koblenz, Germany

Host National Government Keynote Address

Stein, MinDirig Harald; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. KN1-1 - KN1-3; In English; See also 20050192588; Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Modelling and simulation has been used by the German Armed Forces and in German defence programs for more than 30 years. Main application areas so far have been training and exercise in conducting military operations and analyses in context with operations research. The German defence industry have used modelling and simulation extensively for the development of armament material. Today, however we encounter new challenges. Changing threats require changing missions. Therefore different types of military scenarios and doctrines have to be applied. Joint and combined operations are more important than ever before. Fortunately rapidly developing technologies may help to support the Armed Forces to fulfill the new requirements. But the process to field these technologies must be accelerated. In this context a new assessment of military modelling and simulation is helpful and necessary within the changing world, which requires also changes in the military environment known as transformation process. In Germany we are convinced, that modelling and simulation still includes an enormous useful potential to support and enhance defence related activities. Application of modelling and simulation for the provision of the capabilities of our forces can be seen under different points of view: Modelling and simulation are key technologies, especially in the consideration of 'network centric warfare' and 'concept development and experimentation areas'

Derived from text

Defense Industry; Military Operations; Simulation; Training Analysis

20050192603 Fraunhofer-Inst. fuer Informations- und Datenverarbeitung, Karlsruhe, Germany

Modeling and Simulation: Challenges of the Future

Geisler, Juergen; Beyerer, Juergen; Herzog, Reinhard; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004; 22 pp.; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Where we stand? Civil (FhG Leading Edge Innovations) and Military (Network Centric Warfare). What can we do today? And where do we have problems... What are the driving forces for the M&S Community. Technologies are growing together. Integrated Simulation. What comes next?

Derived from text

Simulation; Decision Making; Physical Properties

20050192605 Raytheon Co., Arlington, VA, USA
Digitization Collective Training: Lessons Learned
Jones, Richard F.; Merritt, Jerry C.; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004; 22 pp.; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

MoD addressed digitization collective training during initial BOWMAN program planning: Command Information Systems into the Command and Staff Trainer (CIS into CAST) program. CIS into CAST programme goals: develop digitized Command and Staff Training. Start at the Warminster CAST facility. Provide effective, realistic command information.
Derived from text
Command Guidance; Information Systems

20050192607 North Atlantic Treaty Organization, Brussels, Belgium
Keynote Address: NATO Modeling and Simulation Symposium
Paitard, Xavier; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 1-20; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The summary are: Broad range of transformation activities that need M&S support. Changing role of NATO, look ahead. Capitalize on technical innovations. Develop clear M&S requirements. Avoid duplication, match to user needs. ACT partnership with NMSG, RTA.
Derived from text
North Atlantic Treaty Organization (NATO); User Requirements

20050192609 Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn, Germany
Modelling and Simulation Supporting NATO's Existing and Future Military Requirements
Braitinger, Manfred; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004; 20 pp.; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

With the end of the cold war and new risks worldwide we all have to reconsider existing force structures and their equipment.Information technology and the options of network centric operations will dominate future military actions. Security demands of nations and alliances are changing and CIMIC becomes of more importance. Highly skilled Reaction Forces (RF) with modern high tech equipment as well as Stabilization Forces (SF) with adequate modern outfit will be required.
Derived from text
Mathematical Models; Security; Simulation; Mission Planning

20050192610 Old Dominion Univ., Norfolk, VA, USA
Merging National Battle Management Language Initiatives for NATO Projects
Tolk, Andreas; Galvin, Kevin; Hieb, Michael R.; Khimeche, Lionel; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 12-1 - 12-19; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Battle Management Language (BML) is an unambiguous language used to command and control forces and equipment conducting military operations and provide for situational awareness and a shared, common operational picture. BML is being developed as a standard representation of a 'digitised commander s intent' to be used for real troops, for simulated troops, and for future robotic forces. BML is particularly relevant in a network centric environment for enabling mutual understanding. Within the USA, a prototypical implementation of a Battle Management Language was developed and demonstrated in Spring 2003 using the OneSAF Testbed (OTB) Simulation and a future Army planning system, the Combined Arms Planning and Execution System (CAPES). The US Army BML prototype was used in the UK to analyse the applicability of these concepts to UK doctrine. A French Army BML has also been prototypically implemented in France, within the APLET R&T Program, independently from but well aware of - the US prototype.
Derived from text
Languages; Situational Awareness; Military Operations

20050192637 NASA Langley Research Center, Hampton, VA, USA
Circulation Control in NASA's Vehicle Systems
Rich, Paul; McKinley, Bob; Jones, Greg; Proceedings of the 2004 NASA/ONR Circulation Control Workshop, Part 1; June 2005, pp. 1-35; In English; See also 20050192624; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Specific to the application of any technology to a vehicle, such as circulation control, it is important to understand the process that NASA is using to set its direction in research and development. To see how circulation control fits into any given NASA program requires the reader to understand NASA's Vehicle Systems (VS) Program. The VS Program recently celebrated its first year of existence with an annual review - an opportunity to look back on accomplishments, solicit feedback, expand national advocacy and support for the program, and recognize key contributions. Since its formation last year, Vehicle Systems has coordinated seven existing entities in a streamlined aeronautics research effort. It invests in vehicle technologies to protect the environment, make air travel more accessible and affordable for Americans, enable exploration through new aerospace missions, and augment national security. This past year has seen a series of valuable partnerships with industry, academia, and government agencies to make crucial aeronautics advances and assure America s future in flight.
Derived from text
Feedback; Security; NASA Space Programs

20050193450 Macquarie Advanced Business Concepts, USA
Managing Meetings...Remotely
Woodward, Hugh; ASK Magazine; No. 21; Spring 2005, pp. 39-41; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Remote meetings are best for updates and information sharing, but it is possible to effectively facilitate decisions with a little planning. Generally, the meeting leader needs to clearly state the proposed decision and then separately poll each participant for concurrence. Normally, there will be a range of responses, requiring the facilitator to restate the proposal and repeat the process. Several iterations may be required before a consensus is achieved. I usually confirm decisions by restating the conclusion as it will appear in the meeting notes and asking the participants to express any objections. Gaining commitment to follow-up actions is never easy, of course, but tends to be particularly tricky in remote meetings. The ideal solution is to use collaboration software with a whiteboard as a means of recording the follow-up actions and responsibilities. (A Word or Excel document viewed through NetMeeting works equally well.) But if the meeting is being conducted without collaboration software, the leader must review each follow-up action explicitly, even painstakingly. I generally note follow-up actions throughout the meeting and use the last few minutes to confirm and finalize. I read each action and name the person I think owns the responsibility. When the person accepts, I validate by asking for a completion date. All the normal rules for assigning follow-up actions apply, of course. One, and only one, person must be responsible for each action, and assigning an action to somebody not present is akin to assigning it to nobody.
Derived from text
Iteration; Words (Language); Conferences

20050193454 NASA Johnson Space Center, Houston, TX, USA
Earned Value-Added
Jansen, Michael; ASK Magazine; No. 21; Spring 2005, pp. 14-17; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Earned value management [EVM] ...either you swear by it, or swear at it. Either way, there s no getting around the fact that EVM can be one of the most efficient and insightful methods of synthesizing cost, schedule, and technical status information into a single set of program health metrics. Is there a way of implementing EVM that allows a program to reap its early warning benefits while avoiding the pitfalls that make it infamous to its detractors? That s the question recently faced by the International Space Station [ISS] program.
Derived from text
Early Warning Systems; Management Systems; Schedules; Costs

20050193455 NASA Marshall Space Flight Center, Huntsville, AL, USA
Putting EVM to the Test
Kerby, Jerald; Counts, Stacy; ASK Magazine; No. 21; Spring 2005, pp. 18-21; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

IN MANY INSTANCES THERE IS NO FOREWARNING; SCHEDULES slip, costs soar, and the project manager is faced with the near impossible task of explaining why each impact occurred. With contractors performing the majority of the work, the management job can become even more obscure. The simple lack of proximity to the contractor can limit effective communication. Add to that a mixture of cultural differences and a desire for the contractor to portray the most optimistic view of their performance, and you create an even more difficult task for the project manager. This was the scenario when the Habitat Holding Rack (HHR) manager at Marshall Space Flight Center (MSFC), Stacy Counts, was introduced to the overall concept of Earned Value Management (EVM). Faced with increased costs (which eventually resulted in decreased scope of the project), continued schedule slides, and several technical anomalies, she was looking for a way to gain a better handle on the project performance. As a component of the Space Station Biological Research Program (SSBRP), the HHR project is an integral piece of the Program content. The HHR is the first rack hardware to be delivered for the Program and has therefore been the first rack to move through the trials of test and verification-documenting anomalies and technical difficulties that will benefit the other SSBRP rack projects. For these reasons, the HHR maintained high visibility throughout the manufacturing and assembly process, continuing through test and verification activities. Needless to say, the higher visibility emphasized the need for improved performance on this project. And to improve project performance, Stacy first had to figure out how to measure the cost, schedule and technical objectives effectively.
Derived from text
Project Management; Schedules; Tasks; Anomalies

20050193456 Goshorn (Larry), USA
The Knowledge Stealing Initiative?
Goshorn, Larry; ASK Magazine; No. 21; Spring 2005, pp. 12-13; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

I have the honor of being on the Academy of Program and Project Leadership (APPL) Knowledge Sharing Feedback and Assessment Team (FAA), and as such, I am privileged to receive the feedback written by many of you as attendees of the Project Management (PM) Master s Forums. It is the intent of the FAA Team and APPL leadership to use this feedback as a tool for continuous program improvement. As a retired (sort of) PM in the payload contracting industry, I'm a big supporter of NASA s Knowledge Sharing Initiative (KSI), especially the Master's Forums. I really enjoy participating in them. Unfortunately I had to miss the 8th forum in Pasadena this past Spring, but I did get the feedback package for the Assessment Team work. So here I was, reviewing twelve pages of comments, reflections, learning notes and critiques from attendees of the 8th forum.
Derived from text
Project Management; Leadership; Industries; Knowledge

20050193457 NASA Johnson Space Center, Houston, TX, USA
Earning Value Against Resistance
Jansen, Michael; ASK Magazine; No. 21; Spring 2005, pp. 14-17; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Earned value management (EVM)... can be one of the most insightful methods of synthesizing cost, schedule, and technical status information into a single set of program health metrics.
Derived from text
Project Management; Production Management

20050193458 Ball Aerospace and Technologies Corp., USA
ASK Talks with Bill Townsend
Townsend, Bill; ASK Magazine; No. 21; Spring 2005, pp. 42-46; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Recently retiring from his position as Deputy Director of NASA's Goddard Space Flight Center in Greenbelt, Maryland, Bill Townsend is now the Vice President and General Manager of Civil Space Systems of Ball Aerospace and Technologies Corporation. Prior to his assignment to Goddard in 1998, Mr.Townsend had served as the Deputy Associate Administrator (Programs) for the Office of Earth Science since 1993. For a 20 month period beginning June 1996, he was also the acting Associate Administrator for the Enterprise.
Derived from text
Aerospace Engineering; Aerospace Systems; Earth Sciences

20050193459 Air Force Research Lab., Eglin AFB, FL, USA
A Leader, Not a Hero
Rutledge, Lynda; ASK Magazine; No. 21; Spring 2005, pp. 29-30; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The author writes her experience in leading. She points out that a good leader should know when and how to let go than trying to do all the work by herself. It changed her focus on looking at details, implementation, dealing with the contractors, to leading leading people.
CASI
Contract Management; Personnel Management; Project Management

20050193461 NASA Dryden Flight Research Center, Edwards, CA, USA
Old Journey, New Heights
DelFrate, John; ASK Magazine; No. 21; Spring 2005, pp. 6-9; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

If you could see the road ahead, you might pass up a fantastic opportunity because you're blinded by the potential pitfalls. In my case, I was testing the project management waters at the NASA Dryden Flight Research Center after ten years of being a research engineer. I was an eager (but ignorant) rookie project manager (PM) and I was willing to engage in just about any project without knowing what it would entail. The assignment I accepted was to help NASA's Environment Research Aircraft and Sensor Technology (ERAST) Project, a partnership with a fledgling Uninhabited Aerial Vehicle (UAV) industry, to tackle stratospheric flight. I remember one of our industrial partners querying me about whether or not I understood what 1 was getting into. Like one of those bobble-head toys that have become quite popular, I nodded. But in reality, I didn't have a clue. His response was, 'Hang on, it's going to be a wild ride.' He was right. In retrospect, if I had clearly understood the ten years of pitfalls that were coming, I might not have 'hung on.' Now I can look back and say that I would not trade the experience for anything. The lows included the destruction of a number of UAVs on my watch. Later someone told me that we should not be surprised if we lost one UAV for every ten flights. We wrote many chapters in the book on what can go wrong with UAVs-and we are still writing. As you can imagine, each mishap was accompanied by an investigation. What an education!
Derived from text
Education; Project Management; Research Aircraft

20050194575 George Washington Univ., Washington, DC, USA
A Cooperative Program of Research and Education in Aerospace Vehicle Mechanics
Whitesides, John L.; [2005]; 4 pp.; In English
Contract(s)/Grant(s): NCC1-03024; No Copyright; Avail: CASI; A01, Hardcopy

Since its inception in January 2003, the program has provided support for 1 faculty, 1 research scientist. 1 research assistant, and a total of 7 Graduate Research Scholar Assistants, of these all 7 have gram. The program has generated 4 MS thesis. Attachment: Appendix A, B, C, and D.
Derived from text
Aerospace Vehicles; Research

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20050188577 Space and Naval Warfare Systems Center, San Diego, CA USA
Use of One-Point Coverage Representations, Product Space Conditional Event Algebra, and Second-Order Probability Theory for Constructing and Using Probability-Compatible Inference Rules in Data-Fusion Problems
Goodman, I. R.; Aug. 2001; 13 pp.; In English
Report No.(s): AD-A434188; No Copyright; Avail: CASI; A03, Hardcopy

This paper covers issues relating to the establishment of a sound and conditional probability-compatible rationale for generating linguistic-based inference rules concerning a population. By extending previous preliminary results, the authors detail, in a fully rigorous manner and within the confines of traditional probability theory, that a comprehensive technique can be derived that converts linguistic-based conditional information, couched only in fuzzy-logic terms, into naturally

corresponding conditional probabilities. In turn, they demonstrate how such typically underconstrained conditional probabilities can be combined for suitable conclusions and decision making, via a new use of second-order probability logic. This research is part of the ongoing SSC San Diego In-house Laboratory Independent Research FY 01 project CRANOF (a Complexity-Reducing Algorithm for Near-Optimal Fusion).
DTIC
Algebra; Boolean Algebra; Fuzzy Systems; Inference; Linguistics; Multisensor Fusion; Probability Theory

20050188579 Space and Naval Warfare Systems Center, San Diego, CA USA
The Over-the-Horizon Targeting (OTH-T) Program and the Reconfigurable Land-Based Test Site (RLBTS) Laboratory
McCown, Gary E.; Aug. 2001; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434190; No Copyright; Avail: CASI; A02, Hardcopy

This paper focuses on command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) integration and interoperability testing accomplished by the Over-the-Horizon Targeting (OTH-T) program and the support that the OTH-T program provides the Fleet, including technical expertise afloat and ashore for submarines, surface, and land-based components. Test scalability from recent small-scale tests such as Web replication (Fleet-requested) to large-scale projects such as the Distributed Engineering Plant (DEP) also are discussed. The paper also addresses the Fleet Systems Engineering Team (FSET). FSET support provides system engineering to command centers and numbered fleet commanders, daily network monitoring and troubleshooting of the Officer in Tactical Command Information Exchange Subsystem/Tactical Data Information Exchange System to Pacific Fleet/Atlantic Fleet command centers, and data collection and analysis tools.
DTIC
Command and Control; Computer Networks; Data Systems; Interoperability; Laboratories; Over-the-Horizon Radar; Systems Engineering; Systems Integration; Target Acquisition

20050188590 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Decision Analysis Method for Air Mobility Beddown Planning Scenarios
Salmond, Jacob M.; Mar. 2005; 63 pp.; In English
Report No.(s): AD-A434204; AFIT/GEM/ENS/05M-02; No Copyright; Avail: CASI; A04, Hardcopy

Currently at Air Mobility Command, Plans and Programming, Requirements Division (AMC/A75R), infrastructure requirements for a proposed permanent beddown location are accomplished through corporate knowledge and manual lookup. With the loss of corporate knowledge in the foreseeable future, AMC/A75R is would like to capture this knowledge base in an information system. This research developed a spreadsheet analysis tool that takes hard requirements and compares them with existing capabilities at a given location. Through gap analysis, the tool produced infrastructure requirement shortfalls and associated costs to satisfy the shortfalls.
DTIC
Decision Theory; Mobility

20050188606 Courter Products, Boyne City, MI USA
Military Librarians Workshop: A Premier Gathering of Military Librarians, 1957-1999
Palmer, William A., Jr; Hanna, Marcia; Jun. 2000; 84 pp.; In English
Report No.(s): AD-A434228; No Copyright; Avail: CASI; A05, Hardcopy

The Military Librarian Workshop(MLW) is an annual meeting that brings together civilian and military personnel who serve as special librarians, library supervisors, or technical information officers in military or governmental institutions, or in private organizations that have military mission. Sponsored by the Military Librarians Division (MLD) of the Special Libraries Association (SLA), the yearly meetings have been hosted, on a rotating basis, by the military services (Air Force, Army, Navy/Marine Corps) and agencies of the Department of Defense. To preserve the workshop character of the meetings, the number of attendees has been limited; those who participate do so at the invitation of each year's host. MLW participants share working papers on subjects of particular interest to military librarians, hear formal presentations from experts in their respective fields of library technology, and actively engage in discussions of common professional military library and technical information matters.
DTIC
Libraries; Military Personnel

20050188612 Agency for Healthcare Research and Quality, Rockville, MD USA
Barriers Associated With Medication Information Handoffs
Bayley, K. B.; Savitz, Lucy A.; Rodriguez, Glenn; Gillanders, William; Stoner, Steve; Jan. 2005; 16 pp.; In English
Contract(s)/Grant(s): AHRQ-290-00-0018
Report No.(s): AD-A434235; No Copyright; Avail: CASI; A03, Hardcopy

Objectives: The transfer of medication information across patient care settings is an important care process handoff with major potential for adverse medical events. This paper reports the results of a recently completed AHRQ project, IDS Solutions for Medication Information Transfer Across Patient Care Settings. A primary objective of this research was to enhance understanding of how patient handoffs are related to risk of adverse medical events before and after implementation of an information technology solution. Methods: A series of key informant interviews with relevant staff was systematically conducted at two hospital facilities to understand the medication information transfer process. This led to an informed pre- and post-evaluation of an implemented information technology (IT) solution. Results: Based on thematic analysis of qualitative data, we identified information barriers due to work processes, role definitions, and individual discretion. Underlying these barriers are more basic technical, structural, and cultural challenges that affect the ability of IT to solve the problems inherent in handoffs across diverse settings. Conclusions: Results from this study can be used to inform future research, drive targeted quality improvement interventions and process redesign, and underscore the need to coordinate care across patient care settings to improve patient safety.
DTIC
Conditions; Hazards; Information Transfer; Medical Services

20050188618 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Using Focus Groups in the Refinement of a Research Tool
Constantine, Tara N.; Bourne, Joanna; Bibb, Sandra; Wanzer, Linda; Reilly, Cheryl; Jun. 2005; 22 pp.; In English
Report No.(s): AD-A434247; AFIT-CI04-1107; No Copyright; Avail: CASI; A03, Hardcopy

As part of a larger research study, two graduate students used focus groups to collect data to assist in the refinement of a tool (Patient Assessment Questionnaire, PAQ) to identify the sociodemographic characteristics associated with the presence of body piercings in elective surgery patients. Two focus groups were convened. The first group consisted of perioperative nurse experts who were asked to validate the content in the PAQ. The second group consisted of a convenience sample, similar to the target population for the larger research study. The second group was asked to pilot-test a prototype of the PAQ and provide feedback regarding their experiences with completing it. The authors conclude that the use of focus groups proved to be an appropriate and efficient method for testing and refining a research tool.
DTIC
Evaluation; Group Dynamics; Optimization; Patients; System Effectiveness

20050188649 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Investigation of GeoBase Mission Data Set Design, Implementation, and Usage Within Air Force Civil Engineer Electrical and Utilities Work Centers
Loeber, Paul C.; Mar. 2005; 139 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434289; AFIT/GIR/ENV/05M-10; No Copyright; Avail: CASI; A07, Hardcopy

In 2001, the Office of the Civil Engineer, Installation and Logistics, Headquarters, USA Air Force, (ILE) identified Civil Engineer Squadrons as the central point of contact for all base-level mapping requirements/ activities. In order to update mapping methods and procedures, ILE has put into place a program called GeoBase, which uses private sector Geographic Information Systems (GIS) technology as a foundation. In its current state, GeoBase uses the concept of a 'Common Installation Picture (CIP)' to describe the goal of a consolidated 'visual' that integrates the many layers of mapping information. The CIP visual is formed from a collection of data elements that are termed Mission Data Sets (MDS). There are varieties of MDS each of which contain data specific to a particular geospatial domain. The research uses a case study methodology to investigate how the MDS are designed, implemented, and used within four USAF Civil Engineer Squadron Electrical and Utilities Work Centers. The research findings indicate that MDS design and implementation processes vary across organizations; however, fundamental similarities do exist. At the same time, an evolution and maturation of these processes is evident. As for MDS usage within the Electrical and Utilities Work Centers, it was found that MDS usage is increasing; however, data quality is a limiting factor. Based on the research findings, recommendations are put forward for improving wing/base-level GeoBase program design, implementation, and usage.
DTIC
Data Management; Geographic Information Systems; Mission Planning; Personnel; Structural Engineering; Utilities

20050188651 Agency for Healthcare Research and Quality, Rockville, MD USA

Lessons Learned from the Evolution of Mandatory Adverse Event Reporting Systems

Flink, Ellen; Chevalier, C. L.; Ruperto, Angelo; Dameron, Peg; Heigel, Frederick J.; Leslie, Ruth; Mannion, Janet; Panzer, Robert J.; May 2005; 19 pp.; In English

Report No.(s): AD-A434291; No Copyright; Avail: CASI; A03, Hardcopy

New York State has had a mandatory incident reporting system in place since 1985. The current system, the New York Patient Occurrence Reporting and Tracking System (NYPORTS), was implemented in 1998 pursuant to New York State Public Health Law Section 2805-1, Incident Reporting. NYPORTS is a secure Web-based system that simplifies reporting, coordinates with other reporting systems, and allows hospitals to obtain feedback on their own reporting patterns. The authors review the evolution and implementation of NYPORTS and its predecessors, the Hospital Incident Reporting System and the Patient Event Tracking System. Discussion and data comparisons are made between the Joint Commission on Accreditation of Healthcare Organizations voluntary sentinel event reporting system and NYPORTS. Critical elements for success of a mandatory incident reporting system include collaborative system design; basing the system on statute, with clear definitions and objective reporting criteria; providing meaningful data that can be analyzed and disseminated for improving patient safety; and adequate resources to maintain the system. Innovative program features may be of interest to other States implementing reporting systems.

DTIC

Errors; Health; Information Systems

20050188655 Agency for Healthcare Research and Quality, Rockville, MD USA

Shared Learning and the Drive to Improve Patient Safety: Lessons Learned from the Pittsburgh Regional Healthcare Initiative

Sirio, Carl A.; Keyser, Donna J.; Norman, Heidi; Weber, Robert J.; Muto, Carlene A.; Jan. 2005; 14 pp.; In English

Report No.(s): AD-A434296; No Copyright; Avail: CASI; A03, Hardcopy

Based on lessons learned through implementation of the Pittsburgh Regional Healthcare Initiative's region-wide shared learning model, we have identified the environmental, cultural, and infrastructure changes in health care that will be necessary to achieve significant, widespread patient safety improvement. However, the issues that arise are (1) approaching patient safety as a systems problem, and (2) overcoming challenges that arise when working across 40 hospitals to improve medication safety and infection control through regionwide reporting, information sharing, and problem-solving. Despite regionwide advances in awareness, knowledge, and action regarding patient safety, limitations of current reporting systems and realities constraining their use inhibit widespread error reporting, timely and effective information sharing, and adoption of real-time practice changes that lead to improved patient outcomes. Achievement of improved patient safety requires enhanced health care leadership commitment and learning systems that enable everyone in an organization to identify and solve safety problems to their root cause in real time and share what is learned.

DTIC

Errors; Health; Information Systems; Patients

20050188659 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Effectively Managing the Air Force Enterprise Architecture

Sharkey, Jamie P.; Jan. 2005; 102 pp.; In English; Original contains color illustrations

Report No.(s): AD-A434306; AFIT/GIR/ENV/05M-16; No Copyright; Avail: CASI; A06, Hardcopy

The Air Force is developing and implementing an enterprise architecture to meet the Clinger-Cohen Act's requirement that all federal agencies use an architecture to guide their information technology (IT) investments. However, this act does not provide guidance on how to effectively manage an enterprise architecture. Prior research applied maturity models and competency stages to manage an enterprise architecture by defining layers of enterprise architecture management maturity. However, these efforts tend to view enterprise architecture development as a one-time planning process rather than an iterative progression. Enterprise architecture is not a one-time exercise, but rather it is an on-going effort within the organization to rationalize, integrate, and optimize the IT capability within an organization across many projects and business units. Hence, the critical success factors to effectively manage an enterprise architecture must be identified to ensure the structure, processes, and governing mechanisms are established within the organization for maintaining an enterprise architecture. This research draws from existing academic, professional, and government literature to identify the key issues affecting the Air Force's ability to manage its enterprise architecture effectively. Once identified, a quantitative analysis will assist in interpreting the

qualitative findings in hopes of determining the underlying factors driving these issues.
DTIC
Government Procurement; Information Systems; Management Planning; Systems Management

20050188661 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Technology Acceptance and Use in a Knowledge Management Support System: An Exploratory Case Study of Air Force Knowledge Now Communities of Practice
Tate, John P.; Mar. 2005; 108 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434308; AFIT/GIR/ENV/05M-17; No Copyright; Avail: CASI; A06, Hardcopy

Over the past five to seven years, the USA Air Force has begun to employ online Communities of Practice (CoP) as a means to collaborate virtually. During this time, there have been several studies of these online communities to better understand their use, as well as their lack of use. The primary goal of this research is to apply the theories of Davis' (1989) technology acceptance model to identify the factors that affect the acceptance and use of CoPs. These findings are then used to provide suggestions on how to improve the acceptance and use of CoPs for CoP administrators and, ultimately, the Air Force Knowledge Now (AFKN), the managerial owners of all CoPs. This research used a mixed method strategy to collect data. Data were gathered from a previous research study on AFKN CoPs, a pre-interview survey, and an interview that included both open- and close-ended questions. This method allowed the researcher to converge on the broad results in order to focus on detailed views from the participants. The findings from this research suggest differences in users' perceptions based on functional makeup, formality, access, length of use, and user's grade/position. In addition, the factors of social influence, facilitating conditions, and user acceptance enablers strongly influenced the usage behavior of CoP users. Finally, the interview process exposed numerous factors that encouraged and discouraged use of the CoPs.
DTIC
Information Management; On-Line Systems; Technology Utilization; User Requirements

20050188663 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Key Issues in the Application of Knowledge Management in Education
Mendoza, George A.; Mar. 2005; 91 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434310; AFIT/GIR/ENV/05M-12; No Copyright; Avail: Defense Technical Information Center (DTIC)

Today's world is a fast moving place in which decisions are made with an ever-increasing speed, and the success of an organization rests on its ability to correctly make these decisions. This shift in paradigms has made knowledge the key resource as organizations shift their focus from natural resources to intellectual assets, heralding the use of a concept called Knowledge Management (KM). Despite its acceptance and use in commercial organizations, KM is not being applied in the academic world. No KM models exist for educational use, and no other studies into this topic can be found. This research establishes a foundation for future research by answering the question 'What does current literature identify as the key issues in the application of KM concepts in education?' Forty-eight key issues were uncovered, each with varying levels of emphasis. Further research is required to better define these 48 issues, and to discover the cause of this educational issue gap. The key issues discovered here also can be used to build and test an actual KM model for application in an educational environment.
DTIC
Education; Information Management; Learning

20050188668 Agency for Healthcare Research and Quality, Rockville, MD USA
Patient Safety Data Sharing and Protection From Legal Discovery
Suydam, Steven; Liang, Bryan A.; Anderson, Storm; Weinger, Matthew B.; Jan. 2004; 11 pp.; In English
Report No.(s): AD-A434318; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Institute of Medicine report, to Err Is Human, recommended that collaborative networks of health care organizations should exchange information regarding medical errors to prevent the same errors from being repeated. Another recommendation, that Congress enact legislation protecting such exchanged information from legal discovery, has not occurred. Even if such legislation does pass, it may conflict with existing Federal discovery requirements. Nevertheless, existing State and Federal law may offer some protection. The most promising source of existing protection for all members of patient safety collaboratives is 42 U.S.C. SS299c-3(c), which extends protection to data collection sponsored by the Agency for Healthcare Research and Quality (AHRQ). The Department of Health and Human Services' confidentiality certificates and State peer review protection laws may offer little if any protection. However, with AHRQ sponsorship and the proper structure,

health care organizations may be able to safely exchange information with one another without fear of liability or disclosure of sensitive information.
DTIC
Computer Information Security; Data Acquisition; Data Management; Patients; Safety

20050188679 Agency for Healthcare Research and Quality, Rockville, MD USA
Implementation of a Data-Based Medical Event Reporting System in the U.S. Department of Defense
Davis, Mary A.; Rake, Geoffrey W.; May 2005; 11 pp.; In English
Report No.(s): AD-A434331; No Copyright; Avail: CASI; A03, Hardcopy

As a result of the Institute of Medicine (IOM) report, To Err Is Human, the Department of Defense (DoD), per the direction of President Clinton, developed an action plan to reduce medical errors. A system to track and trend near misses and adverse safety events for all the medical treatment facilities in the DoD was developed. A standard spreadsheet for data collection through e-mail was created and implemented. A relational database management system was utilized for data analysis. The data reporting system is a qualified success. There are limitations with statistical analysis and variations in the data submitted. The system has helped to identify patterns of patient safety errors and areas where patient safety events warrant further investigation.
DTIC
Defense Program; Errors; Medical Services; Military Operations; Spreadsheets; Statistical Analysis

20050188697 Decision Science Associates, Inc., Vienna, VA USA
Multiattribute Utility Analysis for Ultralog
Ulvila, Jacob W.; Chinnis, James O., Jr; Apr. 2005; 105 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-C-0089; DARPA ORDER-J777; Proj-IAST
Report No.(s): AD-A434356; AFRL-IF-RS-TR-2005-147; No Copyright; Avail: CASI; A06, Hardcopy

The goal of this project was to develop and apply appropriate metrics to represent the functional and survivability characteristics of an experimental agent-based logistics system (UltraLog) and to apply the metrics in tools that would assist system designers, developers, and evaluators to compare, quantify, generate figures of merit, and make decisions. To make a survivability claim for UltraLog, it was necessary to demonstrate a particular level of survivability of UltraLog's performance in the face of a given level of information system infrastructure loss. Performance was quantified using concepts from multiattribute utility theory and model parameters elicited from groups of experts. Infrastructure loss was quantified in terms of a novel approach partially based on information system path complexity.
DTIC
Information Systems; Logistics; Software Development Tools

20050188708 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Barriers to Electronic Records Management (ERM): An Exploratory Case Study Investigating ERM in the Deployed Environment During Operations Enduring Freedom and Iraqi Freedom
Hobbs, Brian G.; Mar. 2005; 137 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434370; AFIT/GIR/ENV/05M-07; No Copyright; Avail: CASI; A07, Hardcopy

Corporate and government organizations can use electronic records as an important strategic resource, if the records are managed properly. In addition to meeting legal requirements, electronic records can play a vital role in the management and operation of an organization's activities. Corporate America is facing challenges in managing electronic records, and so too is the U.S. Air Force (USAF). The deployed environment is particularly problematic for electronic records management (ERM). This research, thus, investigates ERM in the deployed environment to identify and characterize the barriers faced by USAF personnel who deployed to locations supporting Operations Enduring Freedom and Iraqi Freedom. This investigation was conducted through a qualitative approach, drawing much of its rich data from in-depth interviews. An exploratory case study was designed using a socio-technical framework and inductive analysis was used to proceed from particular facts to general conclusions. The analysis revealed 15 barriers to ERM. All 15 barriers were determined to exist throughout the entire records lifecycle and were categorized based on common overarching themes. This research reveals some unique barriers contained within the context of a deployed location, while also showing that the barriers are similar to known ERM challenges.
DTIC
Deployment; Records Management

20050188723 Army Engineer Research and Development Center, Vicksburg, MS USA
Dredging Research: Information from the Engineer Research and Development Center. Volume 7, Number 1. Corps Education Center a Big Success
Shirley, Janean; Mar. 2004; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434401; No Copyright; Avail: CASI; A02, Hardcopy

The U.S. Army Corps of Engineers Education center is a an Internet site for students, teachers, librarians and other educators to access its many educational resources, especially in the field of dredging.
DTIC
Dredging; Education; Engineers; Resources

20050188728 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Analysis of Information Assurance Relating to the Department of Defense Radio Frequency Identification (RFID) Passive Network
Giovannetti, Robert G.; Mar. 2005; 66 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434410; AFIT/GIR/ENV/05M-05; No Copyright; Avail: CASI; A04, Hardcopy

The mandates for suppliers to commence Radio Frequency Identification tagging set by Wal-Mart and the Department of Defense is changing this long-time rumored technology into reality. Despite the many conveniences to automate and improve asset tracking this technology offers, consumer groups have obstinately opposed this adoption due to the perceived weaknesses in security and privacy of the network. While the heated debate between consumers and retailers continues, little to no research has addressed the implications of security on the Department of Defense Radio Frequency Identification network. This thesis utilized a historical analysis of Radio Frequency Identification literature to determine whether the current network design causes any serious security concerns adversaries could exploit. The research concluded that at the present level of implementation, there is little cause for concern over the security of the network, but as the network grows to its full deployment, more evaluation and monitoring of security issues will require further consideration.
DTIC
Defense Program; Radio Frequencies; Security

20050188730 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
The Analysis of Air Force Institute of Technology Theses Related to Contracting
Clohessy, Thomas M.; Mar. 2005; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434420; AFIT/GSP/ENV/05M-01; No Copyright; Avail: CASI; A03, Hardcopy

At the end of March 2005, the final students will graduate from the Air Force Institute of Technology's (AFIT) contracting graduate degree curricula --consisting at various times of both contract management and strategic purchasing course sequences -- which have been relocated to the Naval Postgraduate School (NPS). With the end of the contracting graduate programs at AFIT, it is appropriate to ask what contributions AFIT theses have made to the contracting community. Scholars (e.g., Das and Hanfield, 1997) have argued that thesis and dissertation research is one useful method of determining contributions to the field. The author conducted a rigorous review of contracting-related theses done at AFIT to find out what contributions they have made to the contracting community and how future research, performed elsewhere, might continue to make contributions in the future. Through this study it was discovered that the majority of the contracting research conducted at AFIT pertained to purchasing planning, organization, policy, and personnel. There has been little research done on commercial purchasing issues, such as buyer-supplier relationship and supply chain integration. The majority of the research performed was in exploratory study format using mostly case studies, interviews, and surveys to collect data. The most common data analysis techniques used were descriptive statistics (36%) followed by anecdotal evidence (18%), 'other' (16%), and modeling/simulation (15%).
DTIC
Contract Management; Government Procurement; Military Technology; Research and Development; Theses

20050188734 Defense Manpower Data Center, Arlington, VA USA
2004 Workplace and Gender Relations Survey of Reserve Component Members: Tabulations of Responses
Mar. 2005; 750 pp.; In English
Report No.(s): AD-A434439; DMDC-2004-020; No Copyright; Avail: Defense Technical Information Center (DTIC)

The 2004 Workplace and Gender Relations Survey of Reserve Component Members was designed to both estimate the level of sexual harassment and provide information on a variety of consequences of sexual harassment. This report gathered

information on demographics, military workplace information, satisfaction and retention, military/civilian personnel categories and civilian education status, readiness, health, and well-being, gender-related experiences in the military, and personnel policy and practices. In this tabulation volume are an introduction to the survey, cross tabulations of the resulting data on a series of demographic variables of interest to the various policy offices within OUSD(P&R), and a copy of the survey instrument. Results are tabulated by Reserve component, paygrade, Reserve program, activation status, education/employment status, race/ethnicity, gender. Reporting categories are further broken out by gender.
DTIC
Military Personnel; Reserves; Responses; Surveys

20050188740 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Analysis of Biometric Technology as an Enabler to Information Assurance
Deschaine, Darren A.; Mar. 2005; 75 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434466; AFIT/GIR/ENV/05M-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

The use of and dependence on, Information technology (IT) has grown tremendously in the last two decades. Still, some believe the USA is only in the infancy of this growth. This explosive growth has opened the door to capabilities that were only dreamed of in the past. As easy as it is to see how advantageous this technology is, it also is clear that with its advantages come distinct responsibilities and new problems that must be addressed. For instance, the minute one begins using information processing systems, the world of information assurance (IA) becomes far more complex. As a result, the push for better IA is necessary. To reach this increased level of IA, a further dependence on technology has developed. As an example, the field of biometrics has matured and has become an enabler to the U.S. Department of Defense IA model.
DTIC
Biometrics; Defense Program; Military Technology; Security

20050188753 Yale Univ., New Haven, CT USA
Developing Effective Military Leaders: Facilitating the Acquisition of Experience-Based Tacit Knowledge
Matthew, Cynthia T.; Cianciolo, Anne T.; Sternberg, Robert J.; Apr. 2005; 131 pp.; In English
Contract(s)/Grant(s): DASW01-00-K-0014; Proj-B74F
Report No.(s): AD-A434486; ARI-TR-1161; No Copyright; Avail: CASI; A07, Hardcopy

This investigation tested methods derived from Sternberg's theory of practical intelligence (Sternberg et. al, 2000) that were designed to enhance experience-based (tacit) knowledge in military leadership. Two experimental studies were conducted that built on prior research. The first research effort was a quasi-experiment, in which 101 Army officers participated in theory-based reflection interventions or a no-reflection control. Results showed a strong effect of reflection condition on tacit knowledge post-test scores (F(3, 91)=3. 743, p=.01). In the second experiment, 235 college students participated in a theory-based reflection intervention or reflection control. Results showed a marginally significant effect of reflection condition on tacit knowledge post-test performance (Hotellings T(1,233)=.015, p=.06). This intervention suggests that individual reflection interventions based on cognitive theory may promote experiential learning as measured by domain-specific, practical problem-solving.
DTIC
Leadership; Learning; Military Personnel

20050188763 Agency for Healthcare Research and Quality, Rockville, MD USA
The Impact of a Web-Based Reporting System on the Collection of Medication Error Occurrence Data
Rudman, William J.; Bailey, Jessica H.; Hope, Carol; Garrett, Paula; Brown, C. A.; May 2005; 12 pp.; In English
Contract(s)/Grant(s): 1-U18-HS22923-01
Report No.(s): AD-A434517; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper examines the impact of an Internet-based method for the collection of medication error occurrence reports. Data for this study were collected for two time periods. The first data collection effort used a paper-based method and produced the baseline data (January 1994 to December 2000). A second data set was created with information collected from January to December 2003, using a Web-based software application. Four priority areas were developed from the baseline data: (1) increase the overall number of reported medication errors, (2) increase the number of intercepted medication errors, (3) increase the documented number of physician-attributed medication errors, and (4) improve data quality and specificity. Findings from the Web-based method of collecting data show significant improvements across all four areas. The number of documented medication errors increased from an average of 414 between 1994 and 2000, to 959 in 2003. In this same time

period, intercepted errors increased from an average of 17.3 percent to 58.2 percent, and physician-attributed errors increased from an average of 4.8 percent to 27.2 percent. Finally, the missing or unspecified data from the cause-of-error variable decreased from 18.6 percent to 2.1 percent. The electronic system's deliberate anonymity and ease of use, coupled with its ability to expedite reported medication error investigations and the educational efforts directed at the creation of an open reporting environment, are the most likely explanations for the positive impact of the Web-based reporting system.
DTIC
Data Acquisition; Data Management; Drugs; Errors; Information Systems; Internets

20050188776 Agency for Healthcare Research and Quality, Rockville, MD USA
Surveillance of Surgery-Related Adverse Events in Missouri Using ICD-9-CM Codes
Van Tuinen, Mark; Elder, Susan; Link, Carolyn; Li, Susan; Song, John H.; Pritchett, Tracey; May 2005; 14 pp.; In English
Contract(s)/Grant(s): U18-HS11885
Report No.(s): AD-A434535; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study estimated the validity of 23 groups of codes in the International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM or ICD), for flagging adverse events (AEs) related to hospital surgeries. A set of ICD codes selected as 'flags' for inhospital AEs were developed with the assistance of a national expert panel. The codes were grouped into 66 AE classes, 23 of which were identified as potentially surgery-related. The predictive value positive (PVP) of the 23 classes was assessed by medical record review of 941 surgical discharges. The 23 classes identified AEs associated with care management during the hospital stay with an average PVP of 45 percent. They identified AEs specifically related to surgery with a PVP of 37 percent. This exploratory study identified a small number of classes and individual ICD codes that identified surgery-related AEs. Further study of selected codes is needed to refine the classes and fully evaluate their use for statewide surveillance of surgery AEs.
DTIC
Errors; Patients; Surgery; Surveillance

20050188778 Agency for Healthcare Research and Quality, Rockville, MD USA
Medical Injury Identification Using Hospital Discharge Data
Layde, Peter M.; Meurer, Linda N.; Guse, Clare; Meurer, John R.; Yang, Hongyan; Laud, Prakash; Kuhn, Evelyn M.; Brasel, Karen J.; Hargarten, Stephen W.; May 2005; 15 pp.; In English
Contract(s)/Grant(s): U18-HS11893; R49/CCR519614
Report No.(s): AD-A434537; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study sought to determine the feasibility of using routinely collected hospital data for medical injury surveillance. The development, validation, and testing of screening criteria for medical injury was based on International Classification of Disease code discharge diagnoses using 2001 patient data from Wisconsin hospitals. Outcomes included sensitivity, specificity, rate of medical injury per the criteria, and impact of injury on length of stay and hospital charges. Compared with medical records review, the sensitivity of the screening criteria was 59.9 percent and the specificity was 97.4 percent. The rate of medical injury was 133.3 per 1,000 hospitalizations. Patients with a medical injury had a 14.6 percent longer hospital stay and incurred 18.5 percent more in hospital charges than patients without a medical injury. The results show that screening criteria applied to discharge diagnoses identify frequently occurring medical injuries with substantial impact. These criteria are being used to monitor patterns of medical injury in select Wisconsin hospitals to better determine the utility of using hospital discharge data to focus patient safety efforts.
DTIC
Errors; Hospitals; Injuries; Patients; Safety; Surveillance

20050188779 Army Engineer Research and Development Center, Vicksburg, MS USA
Dredging Research: Information from the Engineer Research and Development Center. Volume 7, Number 2
Channell, Mike; Aug. 2004; 13 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434540; No Copyright; Avail: Defense Technical Information Center (DTIC)

Ammonia is a common contaminant of concern in effluent at confined disposal facilities (CDFs). Ammonia is generally present in the dissolved form and therefore is not removed by sedimentation processes in the CDF. Ammonia becomes an issue for 401(b) water quality certification because USEPA and the states have water quality criteria and standards for ammonia in receiving waters based on toxicity to aquatic organisms. Compared to concentrations commonly occurring in CDFs, the ammonia standard of 2-7 milligrams per liter (fresh water depending on temperature) is very low. Ammonia nitrogen also

provides an oxygen demand within the CDF and receiving waters that may become a water quality compliance issue.
DTIC
Ammonia; Dredging

20050188781 Agency for Healthcare Research and Quality, Rockville, MD USA
Ten Considerations for Easing the Transition to a Web-Based Patient Safety Reporting System
Ulep, Sharon K.; Moran, Sheryl L.; May 2005; 17 pp.; In English
Report No.(s): AD-A434542; No Copyright; Avail: Defense Technical Information Center (DTIC)

Moving to a web-based system for tracking patient safety events is a goal of many health care organizations. How does an organization know if it is adequately prepared to make this significant process and cultural change? This article details 10 important considerations, along with additional insights and lessons gleaned from the Henry Ford Health System, Detroit, Michigan, and its successful transition to a paperless, web-based patient safety reporting system. The considerations are as follows: (1) Is the health care organization's (HCO) network and hardware capable of supporting a paperless environment?; (2) Does the organization's current reporting process accurately reflect the number and type of patient safety events that occur in the health care setting?; (3) Does the web-based event reporting system it is considering give the HCO details that will drive quality improvement?; (4) Does the organization consider risk management and patient relations to be independent, unrelated operations?; (5) Is the organization committed to involving staff at all levels in the creation of event reports?; (6) Will management staff in more than one department be used to investigate events and outcomes?; (7) Is the organization ready for transparency?; (8) Can the organization provide the necessary patient safety and risk management education for various levels of staff during a new software product implementation?; (9) Has the organization considered the policy and procedure revisions necessary to accommodate the reporting system change?; and (10) Is the HCO ready to use event data to guide the organization in providing a safer, more satisfying patient experience? The key points from the 10 considerations were further reconfigured as a readiness assessment tool for use by any organization that may be considering a move to a paperless event reporting system.
DTIC
Data Management; Errors; Information Systems; Internets; Patients; Safety

20050188782 Agency for Healthcare Research and Quality, Rockville, MD USA
Identifying, Understanding, and Communicating Medical Device Use Errors: Observations from an FDA Pilot Program
Flack, Marilyn; Reed, Terrie; Crowley, Jay; Gardner, Susan; May 2005; 12 pp.; In English
Report No.(s): AD-A434543; No Copyright; Avail: Defense Technical Information Center (DTIC)

The U.S. Food and Drug Administration (FDA) attempts to identify and understand new risks associated with medical device use; communicate information and recommendations to device users; help manage known risks by providing strategies to facilitate safe use; guide manufacturers to improve design, labeling, and training to address known risks; and guide users to make smart decisions about the acquisition and introduction of new technology. To identify the risks associated with medical devices, FDA has begun development of a device error reporting system, the Medical Product Surveillance Network (MedSun). The purpose of MedSun is to rapidly detect and understand previously unknown and serious problems, particularly close-call events. The heart of MedSun is its relationships with a relatively small, specifically trained and motivated group of workers who are focused on identifying device-related issues. This allows FDA to quickly react to the potential problems and identify the causes, contributing factors, and magnitude of a new risk. MedSun also serves as a virtual laboratory for problem research by focusing on certain devices, units, and users. This provides FDA with a better understanding of device problems, especially the human factors issues. This paper describes the development, implementation, and progress of the MedSun program.
DTIC
Communicating; Errors; Identifying; Medical Equipment; Patients; Safety; Surveillance

20050188784 Agency for Healthcare Research and Quality, Rockville, MD USA
Establishing a Culture of Patient Safety through a Low-Tech Approach to Reducing Medication Errors
Shaha, Steven H.; Brodsky, Linda; Leonard, Michael S.; Cimino, Michael A.; McDougal, Sandra A.; Pilliod, Joann M.; Martin, Kristen E.; May 2005; 15 pp.; In English
Report No.(s): AD-A434545; No Copyright; Avail: Defense Technical Information Center (DTIC)

Transforming an organizational culture is a worthy and achievable endeavor, even when faced with limitations in funding

and technology that appear as insurmountable obstacles. Equally ominous but necessary is the need to conquer commonplace problems such as medication errors. This paper will detail the means used at one hospital facility to make medication errors and their reduction a primary staff focus, and how a highly generalizable, low-tech, and cost-conscious error-reduction methodology spurred a successful shift toward an organization-wide culture of patient safety.
DTIC
Drugs; Errors; Patients; Quality Control; Safety; Therapy

20050188839 University of Southern California, Los Angeles, CA USA
Physician Event Reporting: Training the Next Generation of Physicians
Nguyen, Quang-Tuyen; Weinberg, Joanna; Hilborne, Lee H.; Jan. 2005; 9 pp.; In English
Report No.(s): AD-A434759; No Copyright; Avail: Defense Technical Information Center (DTIC)

Physician reporting of adverse events and unsafe situations remains extremely low, despite the increased access to and use of electronic event reporting systems. We implemented an electronic, Web-based event reporting system at five University of California medical center campuses. While these campuses have witnessed approximately a three-fold increase in staff reporting following the implementation of the electronic system in 2003, physician reporting remains low--only 1.7 percent of all submitted reports were from physicians and only 4.5 percent of registered users are attending physicians and house officers. Our experience validates that of others, specifically, physicians event reporting is a largely elusive practice.
DTIC
Education; Errors; Information Systems; Physicians

20050193453 Strickland (John), USA
Documentation: No Substitute for Communication
Strickland, John; ASK Magazine; No. 21; Spring 2005, pp. 35-37; In English; See also 20050193448; Original contains black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy

SO WHAT IS AN RFI? IT WAS ONE of THE FIRST THINGS I learned about back when I started my project management career with my first large construction firm. I learned how to use these forms as a convenient and effective means of documenting the many legitimate clarifications needed on a major project. However, like most other young engineers, I also learned to use the RFI as a weapon in the ongoing battle between owners. or their designer and the construction contractors. Recently, our project team has done a few simple things to greatly reduce the waste and frustration that comes from this type of battle. The RFI form can be a great tool if used properly, and I certainly don t recommend that they be eliminated entirely. The RFI form was created to document the many clarifications that are commonly required on projects. Typically, the contractor uses the top half of the form to clarify-or request permission to vary from-the contract documents. The bottom half of the form is used to record the answer. But this seemingly simple process is plagued by a number of problems. From the contractor s perspective, RFIs are needed to secure information that should have been in the contract documents in the first place. The missing information keeps their crews from working effectively, and it makes hitting already demanding cost and schedule targets even more difficult. Owners, or their design firms, often view the RFI as a means of harassment. Both sides of the issue have legitimate complaints, and both sides cause most of their own pain.
Derived from text
Project Management; Documentation; Communication; Occupation; Schedules; Targets

20050195896 General Accounting Office, Washington, DC USA
Best Practices: Using a Knowledge-Based Approach to Improve Weapon Acquisition
Schinasi, Katherine V.; Jan. 2004; 10 pp.; In English
Report No.(s): AD-A434594; No Copyright; Avail: CASI; A02, Hardcopy

The Department of Defense (DoD) is on the threshold of several major investments in acquisition programs that are likely to dominate budget and doctrinal debates well into the next decade. Over the next 5 years alone, DoD's overall investments are expected to average $150 billion a year as DoD works to keep legacy systems as well as transform national defense capabilities for the future. To meet this challenge, it is essential that sound foundations for investments in systems be laid now so that the resulting programs can be executed within estimates of available resources. At the request of the Congress, the General Accounting Office (GAO) has been examining ways in which DoD can optimize its investment in weapon systems, drawing on lessons learned from the best, mostly commercial, product development efforts. Leading commercial firms they have studied have developed increasingly sophisticated products in less time and at lower cost. Key to their success is their knowledge-based approach to the acquisition of new products. A knowledge-based approach is supported by incentives that

encourage realism and candor. This booklet highlights the results of GAO's work to date. They continue to explore additional facets of the acquisition process to identify best practices. More details on their work can be found
DTIC
Information Management; Knowledge Based Systems; Optimization; Procurement; Weapon Systems

20050195904 Library of Congress, Washington, DC USA
Balancing Scientific Publication and National Security Concerns: Issues for Congress. CRS Report for Congress
Shea, Dana A.; Dec. 2004; 34 pp.; In English
Report No.(s): AD-A434613; RL31695; No Copyright; Avail: CASI; A03, Hardcopy

The Federal Government has historically supported the open publication of federally funded research results. In cases in which such results presented a challenge to national security concerns, several mechanisms have been employed. For fundamental research purposes, the federal policy has been to use classification to limit dissemination. For advanced technology and technological information, a combination of classification and export and arms trafficking regulation has been used to inhibit its spread. The terrorist attacks of 2001 have increased scrutiny of nonconventional weapons, including weapons of mass destruction, and publication of some research results have increased concerns over whether publication of federally funded extramural research results could threaten national security. The current federal policy, as described in National Security Decision Directive 189, is that fundamental research should remain unrestricted and that in the rare case where it is necessary to restrict such information, classification is the appropriate vehicle to do so. This report covers the following topics: Examples of Research Results of Concern; Past and Current Controls on Information; Current Federal Policy on Scientific Publication; Mechanisms of Governmental Control, including Classification, Export Controls, and Prepublication Review; Recent Policy Actions, including the Card Memorandum, the Department of Defense Draft Directive, Congressional Action, Response of Professional Societies, Department of Homeland Security, and Department of Health and Human Services; and Policy Options, such as Maintaining the Status Quo, Self-Regulation by Scientists, Regulation by Publishers, Federal Regulation (e.g., prepublication review of sensitive but unclassified results, security review at the funding stage, and federal licensing of research), and Oversight of the Department of Homeland Security.
DTIC
Balancing; Classifications; Policies; Security; United States

20050195916 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
An Eleven Year Retrospective of the Acquisition Review Journal
Elder, Mitchell J.; Mar. 2005; 50 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434648; AFIT/GSP/ENV/05M-02; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this research was to examine the evolution of the Acquisition Review Journal (ARJ) through its first 11 years of publication. Researchers assessed the Defense Acquisition community through a review of ARJ articles. They considered what areas academics and practitioners have explored, and how they have explored them. This review documents such characteristics as areas of study, methods of study, and contributors. Trends are identified and conclusions are drawn as to the contribution of the ARJ to the Defense Acquisition community of practice.
DTIC
Defense Program; Periodicals; Procurement; Qualitative Analysis

20050195966 Agency for Healthcare Research and Quality, Rockville, MD USA
Development of a Planning Tool to Guide Research Dissemination
Carpenter, Deborah; Nieva, Veronica; Albaghal, Tarek; Sorra, Joann; Jan. 2005; 10 pp.; In English
Report No.(s): AD-A434748; No Copyright; Avail: Defense Technical Information Center (DTIC)

Investigation in patient safety improvement is constantly yielding new research results, yet efforts to put the results into practice are inconsistent. Therefore, a pragmatic tool is needed. The Dissemination Planning Tool was developed to assist the Agency for Health care Research and Quality (AHRQ) patient Safety grantees with disseminating their research results. It was designed to help researchers consider major areas in dissemination: packaging research results, identifying target users, engaging connector organizations, identifying barriers, developing success measures, and allocating resources to implement the plan. Developing the tool included several stages, beginning with adapting Rogers' seminal diffusion theory. Literature was reviewed from health care, sociology, organizational development, psychology, and social sciences, thus providing a breath

of dissemination theory and practices. Tools currently used in field-specific instances were reviewed. All of these sources were synthesized through a process of refinement, expert review, and testing.
DTIC
Management Systems; Medical Services; Patients; Safety

20050196029 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Validity of Retrospective Reports of Eating Behavior from the Eating Disorder Examination
Stone, Jay M.; Jan. 1999; 74 pp.; In English
Report No.(s): AD-A434842; No Copyright; Avail: CASI; A04, Hardcopy

The Eating Disorder Examination (EDE, Cooper and Fairburn 1987) is the most widely used instrument for the diagnosis of eating disorders. The EDE relies on retrospective self-report to obtain eating behavior information. However, there is growing evidence that retrospective self-reports are prone to errors arising from autobiographical memory. Stone and Shiffman (1994) adopted a method for collecting moment-by-moment data to address these concerns. The present study examined the accuracy of these estimates by comparing retrospective reports from questions on the EDE with data recorded in hand-held computerized eating diaries by obese and normal-weight women. The results suggest some lack of correspondence between the diary data and the EDE for a frequency count of most meal types and for overeating days and episodes, as well as for most cognitive-affective states. Many responses on the EDE appeared anchored at either end, reflecting endorsements of daily or never. However, moment-by-moment recording in the eating diary reflected a range of responses.
DTIC
Data Acquisition; Diets; Eating; Food; Medical Science

20050196104 Navy Center for Applied Research in Artificial Intelligence, Washington, DC USA
Integrating Natural Language and Gesture in a Robotics Domain
Perzanowski, Dennis; Schultz, Alan C.; Adams, William; Jan. 1998; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434961; No Copyright; Avail: Defense Technical Information Center (DTIC)

Human-computer interfaces facilitate communication, assist in the exchange of information, process commands and controls, among many additional interactions. For our work in the robotics domain, we have concentrated on integrating spoken natural language and natural gesture for command and control of a semiautonomous mobile robot. We have assumed that both spoken natural language and natural gesture are more user-friendly means of interacting with a mobile robot, and from the human standpoint, such interactions are easier, given that the human is not required to learn additional interactions, but can rely on 'natural' ways of communication. So-called 'synthetic' methods, such as data gloves, require additional learning; however, this is not the case with natural language and natural gesture. We, therefore, rely on what is natural to both spoken language when it is used in conjunction with natural gestures for giving commands. Furthermore, we have been integrating these interactions with the robotics components as the robotics system is being developed. The interface is not treated as an ad hoc add-on or patch. By doing so, we believe the interface will be more robust and because it is being integrated during system development, we hope to achieve a more seamless interface, one which both acts and feels as an integral part of the robotics application. In this paper, we will discuss the kinds of interactions which our system is currently capable of performing. We will also discuss the processing of the various input to produce an appropriate robotic response. And finally, we will discuss what future kinds of interactions we would like to incorporate into the system, and what will be required to achieve these results.
DTIC
Human-Computer Interface; Natural Language (Computers); Robotics

20050196121 Foreign Military Studies Office (Army), Fort Leavenworth, KS USA
Dialectical Versus Empirical Thinking: Ten Key Elements of the Russian Understanding of Information Operations
Thomas, Timothy L.; Sep. 1998; 28 pp.; In English
Report No.(s): AD-A434981; FMSO/KS-98-21; No Copyright; Avail: Defense Technical Information Center (DTIC)

Finding similarities in the Russian and U.S. approaches to information operations (IO) is not a difficult task. Both countries specialists closely study electronic warfare and command and control systems of other countries, and both stress the importance of the use of computers and information management in the preparation and conduct of modern combat operations. This includes the use of information to conduct psychological operations (PSYOP). Upon closer examination, however, the Russian approach to the information warfare (IW) aspect of IO has several elements that makes it unique and different. There are three principal reasons for the distinct Russian method. First, there is the issue of overall context. The Russian state,

economy, and society are in a transition period resulting in institutional and philosophical instability. Russian mass consciousness, according to many prominent scientists and government officials, is vulnerable to manipulation by slick marketing campaigns and to exploitation by promises of economic and social prosperity during this transition period. As a consequence the Russian specialists approach to information threats places strong emphasis on what it terms information-psychological processes as well as state laws to guarantee the information security of individuals and society. A second reason for a dissimilarity in emphasis is that traditional Russian military thinking developed differently than in the West due to geographical considerations, varied military threats, the economic realities imposed by a different ideological background, and the emphasis placed on the study of military affairs as a science. The Russian study of the impact of the use of information weapons on military art will differ in emphasis from the Western assessment due to this prism through which these operations are viewed and measured, a reflection of the military's traditional thought process.
DTIC
Electronic Warfare; Military Operations; Warfare

20050196136 Air Force Academy, CO USA
Sharing the Knowledge: Government-Private Sector Partnerships to Enhance Information Security
Rinaldi, Steven M.; May 2000; 77 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435015; No Copyright; Avail: Defense Technical Information Center (DTIC)

This is the 33rd volume in the Occasional Paper series of the U.S. Air Force Institute for National Security Studies (INSS). This paper, along with Occasional Paper 32, Richard Aldrich's 'Cyberterrorism and Computer Crimes: Issues Surrounding the Establishment of an International Legal Regime,' address the context surrounding the question of how the U.S. military responds to the cyber threat facing the American military and society today. The U.S. military has become increasingly dependent upon the nation's information and communications infrastructures. Concurrently, threats to and vulnerabilities in these infrastructures are expanding, in large part due to structural factors not likely to disappear in the future. To prevail against the increasing threat, the military -- and, more broadly, the government -- needs to adopt a risk reduction and management program. A crucial element of this risk management program is information sharing with the private sector. However, substantial barriers threaten to block information exchanges between the government and private sector. These barriers include concerns over release of sensitive material under Freedom of Information Act requests, antitrust actions, protection of business confidential and other private material, possible liability due to shared information, disclosure of classified information, and burdens entailed with cooperating with law enforcement agencies. There is good cause to believe that the government and private sector can overcome these barriers, guided by lessons learned from numerous successful government-private sector information-sharing mechanisms. This analysis concludes with actions the government should undertake to develop an information-sharing mechanism with the private sector. Key among them are actively engaging the private sector from the onset, determining information requirements, and fostering a partnership based on trust.
DTIC
Commerce; Industries; Organizations; Risk; Security; United States

20050196139 Geo-Centers, Inc., Wright-Patterson AFB, OH USA
Air Force Genomics, Proteomics, Bioinformatics System, DataCap-Data Collection Module. Phase 1: Development
Geib, Christopher; Frazier, John M.; Cook, Robert S.; Jul. 2004; 38 pp.; In English
Contract(s)/Grant(s): F33615-00-C-6060; Proj-1710
Report No.(s): AD-A435020; AFRL-HE-WP-TR-2004-0110; No Copyright; Avail: CASI; A03, Hardcopy

Cell biology studies involving genomics, proteomics and metabolomics technologies generate large quantities of data. Unfortunately, today's research environment is encumbered by inefficient access to this vital data. Information searches are hampered by disparities on both technical and conceptual levels between individual data sources. The current trend is for data sources to exist as a series of isolated computational silos, providing a depth of data in a narrow field of research. The Acero Genomics Knowledge Platform (GKP) is an enterprise solution that offers fully integrated data-representation across diverse scientific data types and sources. The DataCap data collection module (a part of the Air Force Genomics, Proteomics, Bioinformatics System (AFGPB) application is one module of a series of modules that operate on top of the Acero Platform. The purpose of the DataCap is to provide the individual researcher with the ability to collect experimental data in an integrated format compatible with the Acero GKP. This technical report covers the architecture, the design and the operation of the DataCap in its Phase I configuration.
DTIC
Architecture (Computers); Biomedical Data; Data Acquisition; Data Bases; Genome; Information Systems; Proteins; Proteome

20050196153 Army Research Lab., Aberdeen Proving Ground, MD USA
Command, Control, and Communications: Techniques for the Reliable Assessment of Concept Execution (C3TRACE) Modeling Environment: The Tool
Kilduff, Patricia W.; Swoboda, Jennifer C.; Barnette, B. D.; Jun. 2005; 22 pp.; In English
Report No.(s): AD-A435035; ARL-MR-0617; No Copyright; Avail: Defense Technical Information Center (DTIC)

The U.S. Army Research Laboratory's Human Research and Engineering Directorate has relied on the use of human performance models to assess the effectiveness of command and control (C2) organizational designs for nearly a decade. This work was based on task network modeling in various versions of MicroSaint (developed by Micro Analysis and Design) as the key methodology. The models have been based on representations of C2 tasks and functions performed by a group of people engaged in various military missions, within conceptual and actual military organizational designs, and using various types of communication and information technologies. These organizations have ranged in size from battalion to brigade level, with the inclusion of message flow from companies to a division staff. This report briefly describes these MicroSaint models and how they led to the development of a modeling environment called command, control, and communications - techniques for the reliable assessment of concept execution (C3TRACE). Thus, models can be rapidly constructed with C3TRACE to analyze multiple organizational, personnel, and systems architectures as they emerge through concept exploration for the Army Future Force.
DTIC
Command and Control; Control Systems Design; Decision Making

20050196178 Space and Naval Warfare Systems Center, San Diego, CA USA
SSC San Diego Command History Calendar Year 2004
Mar. 2005; 66 pp.; In English
Report No.(s): AD-A435076; SSC/SD-TD-3194; No Copyright; Avail: CASI; A04, Hardcopy

The activities and accomplishments of Space and Naval Warfare Systems Center San Diego (SSC San Diego) during Calendar Year 2004 are described, and the Center's mission and responsibilities are delineated.
DTIC
Command and Control; Military Operations; Organizations

20050196187 Air Force Academy, CO USA
Cyberterrorism and Computer Crimes: Issues Surrounding the Establishment of an International Legal Regime
Aldrich, Richard W.; Apr. 2000; 104 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435088; No Copyright; Avail: Defense Technical Information Center (DTIC)

This is the 32nd volume in the Occasional Paper series of the U.S. Air Force Institute for National Security Studies (INSS). This paper, along with Occasional Paper 33, Steven Rinaldi's 'Sharing the Knowledge: Government-Private Sector Partnerships to Enhance Information Security,' address the context surrounding the question of how the U.S. military responds to the cyber threat facing the American military and society today. Rinaldi examines the issues of partnering and sharing sensitive information across private and governmental sectors as a central requirement of a national risk reduction and management effort in the face of the threat of cyber attack. In this paper, Richard Aldrich examines definitional and jurisdictional issues, constitutional and statutory concerns, and both the necessity and desirability of an international treaty addressing cyberterrorism and computer crime. Together these two papers provide fresh thinking and critical perspective on a security threat arena that increasingly captivates the headlines.
DTIC
Computer Information Security; Crime; International Law; Law (Jurisprudence); Security; United States

20050196200 Foreign Military Studies Office (Army), Fort Leavenworth, KS USA
Feasibility of Creating a Comprehensive Real Property Database for Colombia
Demarest, Geoffrey B.; Aug. 2002; 47 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435105; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Defense Intelligence Agency asked the Foreign Military Studies Office (FMSO) to determine the feasibility of producing a digital database of Colombian real property, and to express the usefulness of such a database. The resulting study determined that it is feasible and highly recommended that such a database be constructed. USA government foreign policy decisions pertaining to Colombia are inadequately informed if made in the absence of intelligence regarding the ownership of real property. Only a few years ago such an assertion would have been not only curious but unreasonable -- not so much

because property ownership did not influence political actors in foreign countries, but rather because such intelligence could rarely be had. Even when U.S. decision-makers recognized the potential benefits of knowing who owned what in foreign countries, the intelligence challenge was generally insurmountable, at least beyond immediate and anecdotal investigation. Today, property data can be obtained, organized, analyzed and presented in ways that support foreign policy and strategy. A convergence of new technologies, including global positioning satellites, and expanding technical protocols, such as the National Spatial Data Infrastructure, makes provision of property intelligence practicable. The implication for the intelligence community is compelling: Property ownership intelligence should figure along with economic, political, social and military intelligence as part of the suite of product types regularly provided by the intelligence community.
DTIC
Colombia; Data Bases; Digital Data; Geographic Information Systems; Maps

20050196201 Center for Army Lessons Learned, Fort Leavenworth, KS USA
Basic Terminology and Concepts in International Peacekeeping Operations: An Analytical Review
Demurenko, Andrei; Nikitin, Alexander; Sep. 1998; 21 pp.; In English
Report No.(s): AD-A435106; FMSO-98-26; No Copyright; Avail: Defense Technical Information Center (DTIC)
A system of generally accepted peacekeeping terms and concepts has now evolved in international practice. These terms and concepts describe the various types of peacekeeping operations and the directives which pertain to them, and they characterize the actions which are taken in the course of performing these operations. For Russian government structures involved in such operations on CIS territory, analyzing and classifying this terminology has considerable practical importance. An incorrect or inexact usage of terms may lead to confusion or mutual misunderstanding, especially in the conduct of international operations. More important still is that this terminology reflects the essential features of the operations and plays an important role in their planning and execution. Russia does not yet have officially approved peacekeeping terminology. This lack of terminology causes certain problems in preparing for and implementing such operations inside the Commonwealth of Independent States (CIS), and it makes application of internationally accepted standards difficult. Some difficulties also arise because nearly all of the terminology and concepts used in peace operations were developed and formulated in English. Hence, it is not always possible to translate them into Russian literally and yet preserve all the unique features of the English 'original.'
DTIC
Russian Federation; Terminology

20050196206 Stanford Univ., Stanford, CA USA
Onto-Agents-Enabling Intelligent Agents on the Web
Wiederhold, Gio; Studer, Rudi; Musen, Mark; Decker, Stefan; Staab, Steffen; May 2005; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-00-2-0594; DARPA ORDER-K522; Proj-DAML
Report No.(s): AD-A435112; AFRL-IF-RS-TR-2005-178; No Copyright; Avail: Defense Technical Information Center (DTIC)
The objective of OntoAgents project was to develop concepts and modules that can serve as an ontology-driven 'Food Chain' for Advanced Applications on the Web. A number of tools were developed and made available to the community, primarily through webpages. Issues relating to acceptance, growth, and scalability of the semantic web appear in the conclusion.
DTIC
Computer Programming; Information Theory; Internets; Interoperability

20050196229 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Medical Devices, Supporting Networks, and their Vulnerabilities: A Case Study Of the Integration of Medical Networks into the Air Force Information Network
Oleksiak, Paul G.; Mar. 2005; 93 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435146; AFIT/GIR/ENV/05M-13; No Copyright; Avail: Defense Technical Information Center (DTIC)
With the implementation of 'one Air Force, one network' under way it is important to look at how the Air Force plans to incorporate the medical field and its unique systems, networks, and mission. The medical field presents distinctive problems not seen in other areas. Open network vulnerabilities in the medical information systems not only pose a problem for the individual, but to the military service also. Possible security holes provide both access to vital military & personal information

(end strength numbers, current status of personnel, social security), and a door way into the 'network'. Intruders now can possibly access command & control systems and other weapon systems. This research provides insight into the current & future information initiatives dealing with the Air Force's medical field and the Department of Defense's approach to system security. This research additionally looks at the laws and regulations dealing with privacy and ethical issues. This purview starts with the recently enacted Healthcare Insurance Portability and Accountability ACT (HIPPA), and concludes with the Laws of Armed Conflict. The research questions were answered through the use of a Case Study and a comprehensive literature review. The medical and network support teams from two Air Force medical facilities were the basis of this study.
DTIC
Computer Networks; Information Systems; Medical Equipment; Medical Services

20050196258 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Historical Context Analysis of Changes in Content Management Ideology
Lee, William, Jr; Mar. 2005; 63 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435203; AFIT/GIR/ENV/05M-09; No Copyright; Avail: Defense Technical Information Center (DTIC)

Digital content has grown continually over the past years, yet acceptance of a common definition of what is 'content management' still generates debates in IS communities. This research will be a qualitative study using a combined approach of historical and context analysis of literary artifacts for drawing inferences to explore the evolutionary changes in content management ideology. Using a seven-step process, a specific structure is designed with a systematic approach to encounter the phenomena being researched and present the evidence of the results. Performing an analysis on the evolution of content management from a historical perspective will benefit researchers and practitioners with foundational knowledge about this progression and provide insights into understanding concepts and strategies within the content management community.
DTIC
Data Bases; Digital Systems; Histories; Information Management; Information Systems

20050196263 Naval Postgraduate School, Monterey, CA USA
Teaching Objectives of a Simulation Game for Computer Security
Irvine, Cynthia E.; Thompson, Michael; Jun. 2003; 16 pp.; In English
Report No.(s): AD-A435221; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper describes a computer simulation game being developed to teach computer security principles. The player of the game constructs computer networks and makes choices affecting the ability of these networks and the game's virtual users to protect variable assets from attack by both vandals and well-motivated professionals. The game introduces the player to the need for well formed information security policies, allowing the player to deploy a variety of means to enforce security policies, including authentication, audit and access controls. The game will depict a number of vulnerabilities ranging from trivial passwords to trap doors planted by highly skilled, well-funded adversaries.
DTIC
Computer Information Security; Education; Security; Simulation; War Games

20050196275 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Efficient Generation of Social Network Data from Computer-Mediated Communication Logs
Yee, Jason W.; Mar. 2005; 84 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435252; AFIT/GCS/ENG/05-19; No Copyright; Avail: Defense Technical Information Center (DTIC)

The insider threat poses a significant risk to any network or information system. A general definition of the insider threat is an authorized user performing unauthorized actions, a broad definition with no specifications on severity or action. While limited research has been able to classify and detect insider threats, it is generally understood that insider attacks are planned, and that there is a time period in which the organization's leadership can intervene and prevent the attack. Previous studies have shown that the person's behavior will generally change, and it is possible that social network analysis could be used to observe those changes. Unfortunately, generation of social network data can be a time consuming and manually intensive process. This research discusses the automatic generation of such data from computer-mediated communication records. Using the tools developed in this research, raw social network data can be gathered from communication logs quickly and cheaply. Ideas on further analysis of this data for insider threat mitigation are then presented.
DTIC
Computer Information Security; Computer Networks; Data Transmission; Group Dynamics; Information Systems; Interprocessor Communication; Network Analysis; Systems Analysis

20050196279 Army Research Lab., Adelphi, MD USA
Information Technology for the Solider: The Human Factor
Walrath, James D.; May 2005; 18 pp.; In English
Report No.(s): AD-A435271; ARL-TR-3525; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Future Force is the linchpin of the Army's modernization plan. It is a concept embracing the integration of new technology, especially information technology, and revolutionary operational concepts to create a force that totally dominates future land operations across the full spectrum of military operations. The Department of Defense Horizontal Fusion portfolio supports the Future Force goal of revolutionizing the digitization and distribution of information to all echelons, including the rifleman at the edge of battle. This report briefly describes a novel system for providing distributed information technology at the warrior's edge. Soldier reactions to the system, and a critical human factors challenge to such a system's use.
DTIC
Information Systems; Military Personnel; Warfare

20050196742 General Accounting Office, Washington, DC, USA
Information Management: Acquisition of Electronic Records Archives is Progressing
Jul. 2005; 44 pp.; In English
Report No.(s): PB2005-109049; GAO-05-802; No Copyright; Avail: CASI; A03, Hardcopy

Since 2001, the National Archives and Records Administration (NARA) has been working to acquire the Electronic Records Archives (ERA) system. In August 2004, NARA awarded two contracts to design the ERA system. The agency plans to select one of the resulting designs for the development of the system in August 2005. GAO is not making any recommendations at this time because NARA has plans in place to address identified weaknesses.
NTIS
Documents; Information Management; Records Management

20050196811 Brookhaven National Lab., Upton, NY, USA
Evaluated Nuclear Structure Data, File and Related Products
Tuli, J. K.; January 2005; 8 pp.; In English
Report No.(s): DE2005-15011127; BNL-73538-2005; No Copyright; Avail: Department of Energy Information Bridge

The Evaluated Nuclear Structure Data File (ENSDF) is a leading resource for the experimental nuclear data. It is maintained and distributed by the National Nuclear Data Center, Brookhaven National Laboratory. The file is mainly contributed to by an international network of evaluators under the auspice of the International Atomic Energy Agency. The ENSDF is updated, generally by mass number, i.e., evaluating together all isobars for a given mass number. If, however, experimental activity in an isobaric chain is limited to a particular nuclide then only that nuclide is updated. The evaluations are published in the journal Nuclear Data Sheets, Academic Press, a division of Elsevier.
NTIS
Nuclear Physics; Nuclear Structure; Data Bases

20050199436 Korean Atomic Energy Research Inst., Daeduk, Korea, Republic of
Conceptual Data Modeling of the Integrated Database for the Radioactive Waste Management
Park, H. S.; Shon, J. S.; Kim, K. J.; Park, J. H.; Hong, K. P.; Feb. 2003; 16 pp.; In English
Report No.(s): DE2005-825966; No Copyright; Avail: Department of Energy Information Bridge

A study of a database system that can manage radioactive waste collectively on a network has been carried out. A conceptual data modeling that is based on the theory of information engineering (IE), which is the first step of the whole database development, has been studied to manage effectively information and data related to radioactive waste. In order to establish the scope of the database, user requirements and system configuration for radioactive waste management were analyzed. The major information extracted from user requirements are solid waste, liquid waste, gaseous waste, and waste related to spent fuel. The radioactive waste management system is planning to share information with associated companies.
NTIS
Data Bases; Radioactive Wastes; Spent Fuels; Waste Management

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ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20050196730 NASA Glenn Research Center, Cleveland, OH, USA
Opportunities for NASA Aerospace Related Funding and Collaboration
Miranda, Felix A.; [2005]; 30 pp.; In English; University of Puerto Rico-Mayag?ez & Industry: A Partnership for Success in Puerto Rico's New Knowledge Economy, 21 Apr. 2005, Mayaguez, Puerto Rico
Contract(s)/Grant(s): WBS 22-050-33-85
Report No.(s): E-15197; No Copyright; Avail: CASI; A03, Hardcopy

This presentation describes the different opportunities that NASA offers for effective collaboration with Academia and Industry. In particular, the presentation includes a general overview of opportunities such as SBIRs, STTRs, Educational Programs and NASA Research Announcements. A general description of forthcoming competitive opportunities under the Exploration Systems Mission Directorate (ESMD) as well as the Science Mission Directorate (SMD) are also provided.
Author
NASA Programs; University Program; Aerospace Industry; Government/Industry Relations

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TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20050192501 Scripps Institution of Oceanography, La Jolla, CA, USA
SOPAC 2002 IGS Analysis Center Report
Fang, Peng; Jamason, Paul; Prawirodirdjo, Linette; Bock, Yehuda; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 85-91; In English; See also 20050192500; Original contains black and white illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Scripps Orbit and Permanent Array Center (SOPAC) at the Scripps Institution of Oceanography (SIO) has been producing precise satellite orbits, Earth Orientation Parameters, and station positions since 1991 when the Permanent GPS Geodetic Array (PGGA) project was initiated in southern California. SOPAC has been an analysis center from the inception of IGS. This report covers the activities between 2000 and 2002, and will focus on SOPAC s GPS analysis strategy, changes in the software/procedure, and a review of some of the results.
Derived from text
Global Positioning System; Geodesy

20050192509 Natural Resources Canada, Ottawa, Ontario, Canada
NRCan IGS Analysis Center Report for 2002
Mireault, Y.; Donahue, B.; Huot, C.; Tetreault, P.; Hutchison, D.; Heroux, P.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 77-84; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

During 2002 in addition to its continued contribution of GPS products to the IGS, NRCan had the pleasant task of organizing and hosting the first combined Network, Data and Analysis Center IGS Workshop. In 2002 NRCan was also able to improve the quality of its Rapid and Final orbit estimation. The pages that follow document the major changes to the strategies and software use by NRCan to generate the various products contributed to the IGS.
Derived from text
Global Positioning System; Orbit Determination; Orbital Position Estimation

20050192510 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
IGS Network Coordinator Report - 2002
Moore, Angelyn; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 183-191; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The IGS network is a set of permanent, continuously-operating, dual-frequency GPS stations operated by over 100 worldwide agencies. The dataset is pooled at IGS Data Centers for routine use by IGS Analysis Centers in creating precise IGS products, as well as free access by other analysts around the world. The IGS Central Bureau hosts the IGS Network Coordinator, who assures adherence to standards and provides information regarding the IGS network via the Central Bureau Information System website at http://igscb.jpl.nasa.gov.
Derived from text
Global Positioning System; Integrated Library Systems

20050192511 Newcastle-upon-Tyne Univ., Newcastle, UK
The Newcastle GNAAC
Nurutdinov, Konstantin; Lavallee, David; Clarke, Peter; Blewitt, Geoffrey; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 103-109; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The GNAAC at University of Newcastle continued activities with submissions of weekly Gnetwork and P-network SINEX files. The analysis procedure outlined previously (Davis & Blewitt, 2000; Nurutdinov et al., 2000) remained unchanged throughout the years 2001-2002. The IGS97 realization of ITRF97 has been used to constrain the solutions for GPS weeks 1065- 1142. Starting with GPS week 1143 it has been replaced with IGS00 realization of ITRF2000. Combined solutions for Earth Rotation Parameters (Xp, Yp, LOD) have been produced starting with week 1159.
Author
Global Positioning System; Earth Rotation

20050192512 Massachusetts Inst. of Tech., Cambridge, MA, USA
MIT T2 Associate Analysis Center Report
Herring, Thomas A.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 111-115; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

We discuss the analysis of the 2001-2002 combined solutions generated from the SINEX files submitted by the IGS analysis centers. We highlight the changes to the analysis procedures reported in previous annual reports. Analysis of our combined solutions shows mean fits to the up to 49, and on average 43, IGS reference sites in the P041 solution of 3.0 mm. For the GSINEX combinations the median root-mean-square (RMS) repeatability in north, east, and height are 1.5, 1.6 and 5.4 mm, respectively for 256 sites. For the P-SINEX combinations, the median RMS repeatabilities are 1.6, 1.8, and 6,0 mm, respectively for 376 sites. The root mean square (RMS) scatter of the differences between daily pole position and IERS Bulletin A values is 0.08 milli-arc-seconds (mas) for both X- and Y-pole position. However, there are mean differences in Y-pole position of 0.39 mas (2001.0) and a rate of 0.09 mas/yr. The RMS scatters of the differences in polar motion rates are 0.09 mas/day for both components. For length-of-day (LOD), the RMS difference to Bulletin A is 0.023 milliseconds (ms).
Author
Polar Wandering (Geology); Global Tracking Network; Earth Orientation; Earth Rotation

20050192513 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
NASA-Sponsored GPS Global Network Activities
Stowers, D.; Ruud, O.; Khachikyan, R.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 193-195; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Lists NASA supported IGS sites and partner agencies and NASA supported IGS sites upgraded with modern receivers.
CASI
Global Positioning System; NASA Programs

20050192517 California Univ., San Diego, La Jolla, CA, USA
SOPAC 2002 IGS Global Data Center Report
Bock, Yehuda; Scharber, Michael; Malveaux, David; Gilmore, Brent; Jamason, Paul; Fang, Peng; Green, Cecil H.; Green, Ida M.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 155-166; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Scripps Institution of Oceanography's Orbit and Permanent Array Center (SOPAC) at the Cecil H. and Ida M. Green Institute of Geophysics and Planetary Physics (IGPP) has served as a Global Data Center and Global Analysis Center for the IGS since its inception in 1994. SOPAC is responsible for the collection, archival, analysis and publication of high-precision continuous GPS data to support the global GPS community. SOPAC's two primary functions, archival and analysis of GPS-related data and data products, serve the interests of the IGS in addition to a number of other complementary SOPAC activities, including: the Southern California Integrated GPS Network (SCIGN), the National Geodetic Survey, the California Spatial Reference Center (http://csrc.ucsd.edu), NOAA's Forecast Systems Laboratory (FSL), and UNAVCO, Inc.
Author
Global Positioning System; Geophysics

20050192518 NASA Goddard Space Flight Center, Greenbelt, MD, USA
CDDIS 2002 Global Data Center Report
Noll, Carey E.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 137-144; In English; See also 20050192500; Original contains black and white illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Crustal Dynamics Data Information System (CDDIS) has supported the International GPS Service (IGS) as a global data center since 1992. The CDDIS activities within the IGS during 2002 are summarized below; this report also includes any changes or enhancements made to the CDDIS during the past year. General CDDIS background and system information can be found in the CDDIS data center summary included in the IGS 1994 Annual Report (Noll, 1995) as well as the subsequent updates (Noll, 1996, Noll, 1997, Noll, 1998, Noll, 1999, and Noll, 2001).
Derived from text
Global Positioning System; Tectonics; Geodynamics

20050192519 Ecole Nationale des Sciences Geographiques, France
IGN 2002 Global Data Center Report
Gaulue, Edouard; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 145-153; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Institut Geographique National (IGN) has been involved in IGS since its beginning through the Laboratoire de Recherche en Geodesie (LAREG). For a long time, a single person has administrated IGN Global Data Center (GDC): Loic DANIEL. Since May 1st 2001, Edouard GAULUE has been appointed to assist him in his mission as IGS services around data kept growing (new stations, products and data transfer strategies, web developments). Here is a summary of IGN GDC activities from September 2001 to December 2002.
Derived from text
Global Positioning System; Tracking Networks

20050192520 Hartebeesthoek Radio Astronomy Observatory, Johannesburg, South Africa
HartRAO Regional Center Report, 2001-2002
Combrinck, Ludwig; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 173-177; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

HartRAO is located north of Johannesburg, South Africa, in a valley of the foothills of the Witwaters mountain range. HartRAO uses a 26 metre equatorially mounted Cassegrain radio telescope built by Blaw Knox in 1961. The telescope was part of the NASA deep space tracking network until 1975 when the facility was converted to an astronomical observatory. The radio telescope is collocated with an IGS GPS station HRAO and a Satellite Laser Ranging (SLR) station MOBLAS6. HartRAO is the IGS Regional Data Centre for Africa and a TIGA associate analysis centre.
Derived from text
Global Positioning System; Radio Telescopes; Geodesy

20050192523 Federal Agency for Cartography and Geodesy, Frankfurt, Germany
BKG Regional IGS Data Center Report 2002
Habrich, Heinz; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 169-171; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The Federal Agency for Cartography and Geodesy (BKG) operates the Regional IGS Data Center for Europe since the beginning of the IGS Test Campaign in June 21, 1992. GPS tracking data from permanent GPS sites in Europe are obtained from Operational Data Centers (ODC s), Local Data Centers (LDC s), or directly from the stations. Also tracking data from stations outside of Europe are transferred to BKG, if a European institution operates these stations. The received data are uploaded to the Global Data Centers (GDCs), and are also made available to other users. BKG holds the data files from different projects in separate directories in order to handle the project related restrictions, e.g., the project specific user access. A project independent access is additionally realized through a list of all stations and links to the corresponding subdirectories. The operability of the data center is continuously adapted to meet newest requirements. In 2002 the data center was further development through the cooperation with the IGS Data Center Working Group, the preparation of the participation in GSAC, and the design
Derived from text
Global Positioning System; Integrated Library Systems; Geodesy

20050192525 Institute of Geological and Nuclear Sciences Ltd., Lower Hutt, New Zealand
New Zealand Continuous GPS Network (2002)
Beavan, John; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 197-199; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Years 2001 and 2002 have seen a major increase in the number of continuous GPS (CGPS) stations in New Zealand. This is due to a Land Information New Zealand (LINZ) project (PositioNZ) that has seen 12 new CGPS stations installed in the North Island by GNS. During 2003 and 2004, GNS will install a similar density of sites in the South Island, as well as few additional ones in the North Island. In addition to the LINZ project, some 80 continuous sites will be installed over the next 5 years as part of the GeoNet project operated by GNS and funded primarily by the New Zealand Earthquake Commission (EQC). These stations will be sited to provide detailed measurements of tectonic deformation related to the Hikurangi subduction zone, and volcanic/tectonic deformation within the Central Volcanic Region.
Derived from text
Global Positioning System; Information Systems

20050192527 Natural Environmental Research Council, Herstmonceux, UK
The NERC Space Geodesy Facility (2002)
Sherwood, Robert; Appleby, Graham; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 203; In English; See also 20050192500; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The NERC Space Geodesy Facility (NSGF) at Herstmonceux, UK, continues to manage two geodetic-quality, continuously operating, GNSS receivers; an Ashtech Z12 receiver (IGS Station HERS) and an Ashtech Z18 joint GPS/GLONASS receiver (IGS Station HERT). During the period the Ashtech Z18, originally designated station HERP, was moved some 100m from an inferior position close to the laser ranging and radar domes and re-sited at the top of a two-storey unoccupied building, close to an SLR ground calibration target.
Derived from text
Global Positioning System; Geodesy; GLONASS

20050192538 GeoForschungsZentrum, Potsdam, Germany
Report of the Tropospheric Working Group for 2002
Gendt, Gerd; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 209-211; In English; See also 20050192500; Original contains color and black and white illustrations; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Progress was made since the last annual report in the densification of the Final product by inclusion of the high quality EUREF combined tropospheric product. The NRT products were regularly generated with a high reliability (about 99% availability) since two years now. The quality of the IGS combined products both the Final and the NRT - corresponds to better than 1 mm in the water vapor content.
Author
Troposphere; Reports; Global Positioning System

20050192545 Naval Observatory, Washington, DC, USA
USNO IGS Associate Analysis Center
Rohde, J. R.; Slabinski, V. J.; Kammeyer, P. C.; Carter, M. S.; Myers, A. E.; Pascu, D.; Wooden, W. H.; International GPS Service 2001 - 2002 Technical Reports; September 2004, pp. 93-97; In English; See also 20050192500; No Copyright; Avail: CASI; A01, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

USNO contributed rapid, ultra-rapid and tropospheric products to the IGS during 2002. The development of a new way to assign weights to satellite orbits, combining the orbits produced from different approaches, and the introduction of multiple data arc processing to the estimated part of the ultra-rapid solutions were major activities during 2002. The acquisition of a new HP Unix workstation allowed USNO to upgrade to GIPSY/OASIS 2.6, and increase the number of sites processed in both the rapid and ultra-rapid solutions.
Author
Satellite Orbits; Troposphere; Orbital Position Estimation

20050192594 Zrinyi Miklos National Defence Univ., Brno, Hungary
Military Education and Training for Information Warfare
Hopjan, Miroslav; Stodola, Petr; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 14-1 - 14-9; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The paper deals with the Information Warfare issues from educational prospective, what should be done to use, develop and employ the M&S. Our current understanding of possible impact of technology development to warfare, particularly to command and control infrastructure in Information Warfare is presented. This has been topical problem for some years, especially when modern technology can become in terrorists hands effective weapon directed not only against protected military systems, but also against vital civilian systems that can endanger many people when not working properly or when misused. The main part describes different forms of information warfare, attacks and appropriate countermeasures. This places certain requirements to training and education facilities including modelling and simulation infrastructure. Different access is necessary during basic officer training, college study, and staff training phase. Command and Control Information Systems (CCIS) are currently in introduction phase within the Czech Army. Even if CCIS will be fully exploited during CAXes we still will be missing sound base, both in model and scenario areas to prepare commanders properly for future challenges. Another focus is aimed to sensor area, in terms of delivering necessary background in physical principles, wide spectrum surveillance, signal coding and transmission, sensor networking, unaffected failures, jamming and tampering.
Author
Warfare; Information Systems; Command and Control; Military Technology; Education

20050192600 Army Communications-Electronics Command, Fort Monmouth, NJ, USA
Train as You Fight: SINCE - the Key Enabler
Klose, Dirk R.; Mayk, Israel; Sieber, Michael; Menzler, Hans Peter; Modelling and Simulation to Address NATO's New and Existing Military Requirements; October 2004, pp. 8-1 - 8-13; In English; See also 20050192588; Original contains color illustrations; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

US and Germany are conducting three R&D experiments under Simulation and C2 Information Systems Connectivity Experimentation (SINCE) Project. These efforts enable real-time information exchange, and coupling between combat simulation systems and command control (C2) information systems as needed to support the conduct of International Warfighter Experiments. Key SINCE enablers are the C2Sim Proxy Service/Server and the Web-based C2 Collaboration Portal (WCP). The C2Sim Proxy Service is used by both the US and the Germany to link national simulation systems with national C2 systems. Interoperability between US and GE C2 systems is implemented using the Multilateral Interoperability Program (MIP) standard. Interoperability between US and German Combat simulation systems is implemented using High Level Architecture (HLA) standard. The WCP is being developed by the US and jointly tested by both sides to support both collaborative exchange of continuous planning information and display of the Coalition Common Operational Picture (CCOP). Initial SINCE capabilities were successfully demonstrated during Experiment 1a in November 2003 at WTD 81, Germany, with over thirty technical and military participants. The demonstration included real-time information exchange between the US and German C2 Systems and Simulation Systems. Significant technical capabilities demonstrated in this experiment are: (1) Automatic initialization of diverse systems and demonstration that they all displayed the same Operational Picture, (2) Simulated Blue and Red Force movement and position updates generated in either the US or German simulation systems could be published and viewed in real-time, (3) coalition force collaborative planning and force synchronization

activities could be conducted via use of the WCP. Participating US and German military users agreed that the Experiment 1a had successfully demonstrated the linking of real C2 and M&S systems and opening the potential for future use of real-world Warfighter C2 systems in simulation-based training exercises. The SINCE Operational Experiment 1B was conducted during 12 through 23 July 04 at the 35th ID Combat Training Center (CTC) Facilities located near Ft. Leavenworth KS. A slightly enhanced and reconfigured version of the SINCE Experiment 1a environment was implemented to support this experiment. In this paper we will present more details on the technical environment implemented to support these recent experiments and also discuss the lessons learned associated with their conduct. These SINCE experiments followed, adopted and adapted a code of best practice approach for experimentation. The compromises and trade-offs made to establish a balance between (a) development of an infrastructure that supports both the current and future planned experiments, compared with (b) just implementing an experimental configuration used for conduct of a specific experiment, will be discussed. An integral part of the solution was the establishment of the methodology by which the various information architectures would be harmonized within federations and across federations. Additionally some insights into the operational lessons learned from the conduct of these experiments will also be presented and discussed. The innovative technical and operational interoperability capabilities that SINCE is implementing and demonstrating represent a significant step forward in coupling Warfighter C2 systems and combat simulation systems. SINCE has demonstrated essential capabilities needed to support simulation-based coalition force military training, and mission rehearsal activities, thereby enabling users to train with the same C2 systems they fight with. Author

Military Operations; Systems Simulation; Command and Control; Information Systems; Interoperability; Real Time Operation; Synchronism; Education

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20050198959 NASA Glenn Research Center, Cleveland, OH, USA

Ground Based Microgravity Emissions Testing Of Flight Hardware

Samorezov, Sergey; McNelis, Anne M.; July 2004; 9 pp.; In English; International Congress on Sound and Vibration, July 2004, Saint Petersburg, Russia

Contract(s)/Grant(s): 22-770-00-04

Report No.(s): E-14762; No Copyright; Avail: CASI; A02, Hardcopy

To control microgravity environment on the International Space Station (ISS), NASA developed payloads have to meet the payload integration requirements of the Space Station Program, specifically a microgravity allocation plan. The Microgravity Emissions Laboratory (MEL) was developed at NASA Glenn Research Center (GRC) for verification of the payloads compliance with payload integration requirements. MEL is a 6 degree of freedom inertial measurement system capable of characterizing the microgravity emissions, generated by a disturber, down to a micro g. Microgravity Emissions tests provide a payload developer with a tool to assess payload's compliance with the requirements, i.e. forces and moments, generated by the payload at its center of gravity. Forces and moments are presented in time domain for both stationary and transient signals, and in frequency domain for the stationary signals. To date, MEL conducted over thirty tests of ISS hardware. The test results are being successfully used by the payload developers for design verification and improvement.
Author

Microgravity; International Space Station; Hardware; Ground Tests; Emission

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20050188589 Naval Observatory, Washington, DC USA

An Examination of the Change in the Earth's Rotation Rate From Ancient Chinese Observations of Lunar Occultations of the Planets

Hilton, James L.; Seidelmann, P. K.; Ciyuan, Liu; Jul. 1992; 4 pp.; In English

Report No.(s): AD-A434203; No Copyright; Avail: CASI; A01, Hardcopy

A study is made of fifty-eight records of naked eye observations of occultations of the planets by the Moon chosen from the Chinese dynastic histories. These records cover the period from 68 B.C. to 575 A.D. Fifty-three of these records fall in the time period between 100 A.D. and 575 A.D., a period with no other known observations useful for Earth rotation studies. The observations are compared to topocentric ephemerides computed using Bretagnon's planetary theories VSOP82 and the Chapront-Touze lunar theory ELP2000-85. The area of the Earth from which an individual lunar occultation is observable is too large to produce a useful value of the acceleration parameter, C (Cr2=ET-UT) , from untimed occultation records. However, the entire series of observation records produces a weak estimate for the value of C (12.6 s cy-2 to 35.7 s cy-2) . The uncertainty in C is difficult to estimate. Overall, the check on the change in the rotation rate is very weak, but it represents the limit of what can be done with known, untimed occultation records.
DTIC
China; Earth Rotation; Lunar Occultation; Planets

20050188593 Naval Observatory, Washington, DC USA
Improving the Visual Magnitudes of the Planets in The Astronomical Almanac. I. Mercury and Venus
Hilton, James L.; Jan. 2005; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434209; No Copyright; Avail: CASI; A03, Hardcopy

Estimates for the apparent V magnitudes of the planets currently published in The Astronomical Almanac are based on phase coefficients presented in Harris (1961) along with values for V(1,0) from de Vaucouleurs (1970). Work is currently underway to update these values. The apparent V magnitudes of Mercury and Venus are examined here. This analysis provides new values for V(1,0) derived from a variety of V photometric data sets for both Mercury and Venus. New data show that the previous value of V(1,0) for Venus was approximately 0.10 mag too faint because the small aperture used with photoelectric tubes did not capture all of the light from Venus' relatively large disk. The Venus photometry also shows an abrupt and distinct 'tail' beginning at a phase angle of about 160 degrees, that is the curve abruptly changes direction somewhere between a phase angle of 160 degrees and 165 degrees and begins ascending. Circumstantial evidence suggests that this tail is caused by sunlight forward scattered through Venus' atmosphere. The RMS scatter in the calculated magnitudes was found to be 0.10 mag for Mercury and 0.07 mag for Venus.
DTIC
Astronomy; Magnitude; Mercury (Planet); Planets

20050188594 Naval Observatory, Washington, DC USA
Faraday Rotation Measure Gradients from a Helical Magnetic Field in 3C 273
Zavala, R. T.; Taylor, G. B.; May 2005; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434210; No Copyright; Avail: CASI; A03, Hardcopy

Using high frequency (12-22 GHz) VLBA observations we confirm the existence of a Faraday rotation measure gradient of ^500 rad m-2 mas-1 transverse to the jet axis in the quasar 3C 273. The gradient is seen in two epochs spaced roughly six months apart. This stable transverse rotation measure gradient is expected if a helical magnetic field wraps around the jet. The overall order to the magnetic field in the inner projected 40 parsecs is consistent with a helical field. However, we find an unexpected increase in fractional polarization along the edges of the source, contrary to expectations. This high fractional polarization rules out internal Faraday rotation, but is not readily explained by a helical field. After correcting for the rotation measure, the intrinsic magnetic field direction in the jet of 3C 273 changes from parallel to nearly perpendicular to the projected jet motion at two locations. If a helical magnetic field causes the observed rotation measure gradient then the synchrotron emitting electrons must be separate from the helical field region. The presence or absence of transverse rotation measure gradients in other sources is also discussed.
DTIC
Faraday Effect; Magnetic Field Configurations; Magnetic Fields; Plasma Jets; Rotation

20050188595 Naval Observatory, Flaggstaff, AZ USA
Stars in the USNO-B1 Catalog with Proper Motions between 1.0 and 5.0 Arcseconds Per Year
Levine, Stephen E.; Mar. 2005; 43 pp.; In English
Report No.(s): AD-A434215; No Copyright; Avail: CASI; A03, Hardcopy

This paper examines a subset of objects from the USNO-B1 catalogue with listed proper motions between 1.0 and 5.0 arcseconds per year. We look at the degree of contamination within this range of proper motions, and point out the major sources of spurious high proper motion objects. Roughly 0.1% of the objects in the USNO-B1 catalogue with listed motions

between 1.0 and 5.0 arcseconds per year are real. Comparison with the revised version of Luyten's Half Second catalogue indicates that USNO-B1 is only about 47% complete for stars in this range. Preliminary studies indicate that there may be a dip in completeness in USNO-B1 for objects with motions near 0.1 arcseconds per year, 36 new stars with confirmed motions between 0.1 and 1.0 arcseconds per year, several new common proper motion pairs, and the recovery of LHS 237a (VBs3).
DTIC
Catalogs (Publications); Motion

20050188596 Naval Observatory, Washington, DC USA
Progress in Parallaxes at USNO
Harris, H. C.; Canzian, B.; Dahn, C. C.; Guetter, H. H.; Henden, A. A.; Levine, S. E.; Luginbuhl, C. B.; Monet, A. K.; Monet, D. G.; Munn, J. A.; Jan. 2005; 5 pp.; In English
Report No.(s): AD-A434216; No Copyright; Avail: CASI; A01, Hardcopy

The accuracy of trigonometric parallaxes from the U.S. Naval Observatory (USNO) has continued to improve. An optical CCD camera is used regularly on the 61-inch telescope. It produces parallaxes with typical errors of + or - 0.5 mas, and can reach + or _ 0.3 mas with some effort. The program provides distances, absolute magnitudes, and tangential velocities accurate to a few percent for many white dwarfs and low-luminosity red and brown dwarfs. Other classes of special interest being observed are planetary nebulae, cataclysmic variables, dwarf novae, and dwarf carbon stars. Some stars show residual perturbations from a close companion, and the astrometric orbital solutions indicate a brown dwarf or (in a few cases) a possible planetary-mass companion. In addition, a near-IR InSb camera is used for parallaxes of very red L and T brown dwarfs. We discuss the relationship of USNO and other programs, and the prospects for further progress.
DTIC
Astronomical Photography; Cameras; Charge Coupled Devices; Dwarf Stars; Infrared Radiation; Parallax; Progress

20050188735 Naval Observatory, Washington, DC USA
Development of Carrier-Phase-Based Two-Way Satellite Time and Frequency Transfer (TWSTFT)
Fonville, Blair; Matsakis, Demetrios; Pawlitzki, Alexander; Schaefer, Wolfgang; Jan. 2005; 17 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434440; No Copyright; Avail: Defense Technical Information Center (DTIC)

For the dissemination of precise time and frequency, the use of the Two-Way Satellite Time and Frequency Transfer (TWSTFT) method has, in recent years, become increasingly valuable. By the application of spread-spectrum technology, a client station, located anywhere within a common satellite s footprint, can link to a reference station and compare or synchronize its clock to the reference clock within nanoseconds or better with high levels of confidence. But as the frequency stabilities of today's sophisticated atomic-level clocks improve, so must the stability of a Two-Way system s method of time and frequency transfer. Carrier-phase information holds the promise of improving the stabilities of TWSTFT measurements, because of the great precision at which frequency transfers can be achieved. The technique requires that each site observe both its own satellite-translated signal and that of the cooperating site. As was reported in earlier papers, the translation frequency of the satellite itself is an additional unknown factor in the measurement, and it must be taken into consideration. However, it can be shown that simple estimates of the satellite s local oscillator (LO) frequency will suffice. Recent work has been conducted with implementation of the signal carrier-phase in operational TWSTFT links. The purpose of this paper is to discuss this recent work, with emphasis on the system's development.
DTIC
Frequencies

20050188765 Air Force Research Lab., Hanscom AFB, MA USA
Long-Term Solar Variability: Evolutionary Time Scales
Radick, Richard R.; Pap, Judit M.; Fox, Peter; Frohlich, Claus; Hudson, Hugh S.; Kuhn, Jeffrey; McCormack, John; North, Gerald; Sprigg, William; Wu, S. T.; Jan. 2004; 13 pp.; In English
Contract(s)/Grant(s): Proj-2311
Report No.(s): AD-A434519; AFRL-VS-HA-TR-2005-1067; No Copyright; Avail: CASI; A03, Hardcopy

Galileo, who played a central role in the modern discovery of sunspots, may have wondered whether the Sun varies. Certainly, his 17th century contemporaries did. The Sun itself all but answered this question a few decades later when it nearly stopped forming sunspots as it entered what is now known as the Maunder Minimum. Herschel's speculation that the price of wheat might be related to the number of sunspots indicates that the possibility of solar variability was firmly established

in the scientific thought of the late 18th century (Eddy, 1983). In the mid-19th century, the approximately 11-year variation in sunspot number was recognized, apparently first by Schwabe.
DTIC
Solar Activity; Sun; Sunspots

20050188786 Air Force Research Lab., Hanscom AFB, MA USA
The Variability of Sunlike Stars on Decadal Timescales
Radick, Richard R.; Lockwood, G. W.; Henry, G. W.; Baliunas, S. L.; Jan. 2004; 8 pp.; In English
Contract(s)/Grant(s): Proj-2311
Report No.(s): AD-A434549; AFRL-VS-HA-TR-2005-1068; No Copyright; Avail: CASI; A02, Hardcopy

The authors have successfully combined photometric observations of about 30 sun-like stars from Mount Wilson, Lowell, and Fairborn Observatories to extend their joint time series from 12 to 17 years. The stability of the statistical relationships between chromospheric and brightness variability, derived previously, suggests that the full range of variation on the decadal time-scale has probably now been observed for most of their program stars. Young, active stars become fainter as their chromospheric Ca II HK emission increases, while older, less active stars, such as the Sun, become brighter as their HK emission increases. The Sun's photometric variation still appears to be somewhat small in amplitude at present, compared to other stars in this sample with similar mean chromospheric activity.
DTIC
Brightness; Chromosphere; Emission; Periodic Variations; Photometry; Stellar Evolution; Time Series Analysis; Variability; Variable Stars

20050192581 Space Telescope Science Inst., Baltimore, MD, USA
Properties of Planet-Forming Prostellar Disks
Lindstrom, David, Technical Monitor; Lubow, Stephen; July 18, 2005; 5 pp.; In English
Contract(s)/Grant(s): NAG5-10732; STScI Proj. J0308; No Copyright; Avail: CASI; A01, Hardcopy

The proposal achieved many of its objectives. The main area of investigation was the interaction of young planets with surrounding protostellar disks. The grant funds were used to support visits by CoIs and visitors: Gordon Ogilvie, Gennaro D Angelo, and Matthew Bate. Funds were used for travel and partial salary support for Lubow. We made important progress in two areas described in the original proposal: secular resonances (Section 3) and nonlinear waves in three dimensions (Section 5). In addition, we investigated several new areas: planet migration, orbital distribution of planets, and noncoorbital corotation resonances.
Derived from text
Accretion Disks; Protostars; Planetary Evolution

20050192584 Space Telescope Science Inst., Huntsville, AL, USA
How Does Abundance Affect the Strength of UV Emission in Elliptical Galaxies?
Sonneborn, George, Technical Monitor; Brown, Thomas; July 15, 2005; 2 pp.; In English
Contract(s)/Grant(s): NAG5-12278; STScI Proj. J0396; No Copyright; Avail: CASI; A01, Hardcopy

This program used the Far Ultraviolet Spectroscopic Explorer (FUSE) to observe elliptical galaxies with the intention of measuring the chemical abundances in their hot stellar populations. It was designed to complement an earlier FUSE program that observed elliptical galaxies with strong UV emission. The current program originally planned observations of two ellipticals with weak UV emission (M32 and M49). Once FUSE encountered pointing control problems in certain regions of the sky (particularly Virgo, which is very unfortunate for the study of ellipticals in general), M49 was replaced with the bulge of M31, which has a similar UV-to-optical flux ratio as the center of M49. As the closest elliptical galaxy and the one with the weakest UV-to-optical flux ratio, M32 was an obvious choice of target, but M49 was the ideal complementary target, because it has a very low reddening (unlike M32). With the inability of FUSE to point at Virgo, nearly all of the best elliptical galaxies (bright galaxies with low foreground extinction) were also lost, and this severely hampered three FUSE programs of the PI, all focused on the hot stellar populations of ellipticals. M31 was the best replacement for M49, but like M32, it suffers from significant foreground reddening. Strong Galactic ISM lines heavily contaminate the FUSE spectra of M31 and M32. These ISM lines are coincident with the photospheric lines from the stellar populations (whereas M49, with little foreground ISM and significant redshift, would not have suffered from this problem). We have reduced the faint (and thus difficult) data for M31 and M32, producing final co-added spectra representing all of the exposures, but we have not yet finished our analysis, due to the complication of the contaminating ISM. The silver lining here is the set of CHI lines at 1175 Angstroms,

which are not significantly contaminated by the ISM. A comparison of the M31 spectrum with other galaxies observed by FEE showed a surprising result: the hot stars in M31 seem to have a similar carbon abundance to those stars in galaxies with much brighter UV emission. The fraction of these hot stars in a population should be a strong function of chemical abundances, so this finding warrants further exploration, and we are proceeding with our analysis. Because the UV emission in these galaxies comes from a population of extreme horizontal branch stars, the PI (Brown) presented this result at a June 2003 conference on such stars.
Author
Abundance; Elliptical Galaxies; Ultraviolet Radiation

20050192616 Space Telescope Science Inst., Baltimore, MD, USA
A Snapshot Survey of AGNS/QSOS for Intergalactic Medium Studies
Sonneborn, George, Technical Monitor; Sembach, George; July 15, 2005; 2 pp.; In English
Contract(s)/Grant(s): NAG5-13707; STScI Proj. J1073; No Copyright; Avail: CASI; A01, Hardcopy

This spectroscopic program with the Far Ultraviolet Spectroscopic Explorer (FUSE) program was designed to identify ultraviolet-bright active galactic nuclei (AGNs) and quasi-stellar objects (QSOs) for follow-up spectroscopy with FUSE and the Hubble Space Telescope (HST). All of the FUSE spectra obtained for this snapshot program (FUSE identifier D808) have been examined for data quality and flux levels. As expected, only a small number of objects observed (4/19) have flux levels suitable for follow-up spectroscopy. A portion of our effort in this program was devoted to comparing the spectra obtained in these snapshot exposures to others to determine if the spectra could be used for detailed scientific analyses. The resulting effort demonstrated that some of the brighter sources are relatively stable (non- variable), as determined through comparisons of the spectra at multiple epochs. For these brighter sources, the exposure times are simply too short to perform meaningful detailed analyses. Comparisons of the absorption lines in these spectra with those of higher signal-to-noise spectra, like those of PG1116+215 and H1821+643, showed that many of the lines of interest could not be characterized adequately at the S/N levels reached in the short snapshot exposures. As a result, the FUSE D808 observations are suitable only for their original purpose - flux determination. Several bright objects identified as part of this program include: HE0153-4520, flux \g2x10E-14 erg cm^-2s^-1 at 1000 Angstroms IRASF04250-5718, flux \g4x10E-14 erg cm^-2s^-1 A^-1 at 1000 Angstroms RXJ2154.1-4414, flux \g 1.6x10E-14 erg cm^-2s^-1 A^-1 at 1000 Angstroms S50716+714, flux \g2.5x10E-14 erg cm^-2s^-1 A^-1 at 1000 Angstroms. All of these objects have been incorporated into the primary target lists for the HST Cosmic Origins Spectrograph. Identifying such objects for follow-up observations with HST/COS was the primary goal of this program, so the program wa successful. In addition, some of the objects were included in proposed target lists for future FUSE observations. Given that the state of the FUSE observatory is uncertain at this time, it is unknown whether anyjof htese objects will be re-observed with FUSE. The results of this program have been communicated to the astronomical community via email and by word of mouth since the resuts in and of themselves do not warrant publication in an astronomical journal. However, these lists will be maintained for future observers. The data are archived in the Multi-Mission Archive at the Space Telescioe Science INstitute.
Author
Active Galactic Nuclei; Intergalactic Media; Surveys; Quasars; Spectrographs; Astronomy

20050192617 California Inst. of Tech., Pasadena, CA, USA
The Highest L(sub X)/L(sub opt) Sources in the ROSAT All-Sky Survey
Kulkarni, Shrinivas R.; [2005]; 3 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNG04GF96G; No Copyright; Avail: CASI; A01, Hardcopy

The purpose of our program was to identify new and interesting soft X-ray sources from the Bright Source Catalog of the ROSAT All-Sky Survey. Our intent was to use XMM to observe a sample of BSC objects that had been identified as less than 10% likely to be associated with any object in the USNO-A2.0 catalog (Rutledge et al. 2000). We requested a single 5-ks pointing for each of 32 sources in this category in order to make a systematic examination of the properties of these sources. Ultimately, we hoped to identify new isolated neutron stars from within this population. Our requested observations were scheduled for execution at the end of Cycle 2, for two of our targets only (selected by sky position). A two-target sample does not allow for the statistical investigation that we originally proposed; however, based on the identification of the BSC object in the XMM data, an improved position, and reevaluation of likely off-band counterparts, it does enable a source-by-source evaluation of whether the BSC object is an isolated neutron star (INS).
Author
Rosat Mission; Sky Surveys (Astronomy); X Ray Sources

20050192618 California Inst. of Tech., Pasadena, CA, USA
The Nature of the Flaring EUVE Companion to HD 43162
Kulkarni, Shrinivas R.; [2005]; 3 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNG04GH18G; No Copyright; Avail: CASI; A01, Hardcopy

The purpose of our program was to observe and characterize the companion to HD 43162, EUVE J0614-2354, which (serendipitously) experienced an enormous flare event during our EUVE observation of HD 43162, one of the nearby solar analogs that we observed during our survey of this population. Our observation was carried out and the data have been received and reduced. We are able to identify EUVE J0614-2354 in both the X-ray (EPIC MOS + PN) and the UV (OM) data, which provides a sub-arcsecond position for this source. Our findings are consistent with the analysis of Christian et al. (2003a,b), who identify EUVE J0614-2354 with a coronally-active M-dwarf star at distance d = 15 plus or minus 5pc. The X-ray spectrum from the EPIC data are also consistent with this identification.
Author
Extreme Ultraviolet Explorer Satellite; Dwarf Stars; Companion Stars; Astronomy

20050192619 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Coronal Structures in Cool Stars
Oliversen, Ronald, Technical Monitor; Dupree, Andrea K.; July 2005; 5 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAG5-11093
Report No.(s): SAO-16613385; No Copyright; Avail: CASI; A01, Hardcopy

We have extended our study of the structure of coronas in cool stars to very young stars still accreting from their surrounding disks. In addition we are pursing the connection between coronal X-rays and a powerful diagnostic line in the infrared, the He I 10830Angstrom transition of helium. Highlights of these are summarized below including publications during this reporting period and presentations. Spectroscopy of the infrared He I (lambda10830) line with KECK/NIRSPEC and IRTF/CSHELL and of the ultraviolet C III (lambda977) and O VI (lambda1032) emission with FUSE reveals that the classical T Tauri star TW Hydrae exhibits P Cygni profiles, line asymmetries, and absorption indicative of a continuous, fast (approximately 400 kilometers per second), hot (approximately 300,000 K) accelerating outflow with a mass loss rate approximately 10(exp -11)-10(exp -12) solar mass yr(sup -1) or larger. Spectra of T Tauri N appear consistent with such a wind. The source of the emission and outflow seems restricted to the stars themselves. Although the mass accretion rate is an order of magnitude less for TW Hya than for T Tau, the outflow reaches higher velocities at chromospheric temperatures in TW Hya. Winds from young stellar objects may be substantially hotter and faster than previously thought. The ultraviolet emission lines, when corrected for absorption are broad. Emission associated with the accretion flow and shock is likely to show turbulent broadening. We note that the UV line widths are significantly larger than the X-ray line widths. If the X-rays from TW Hya are generated at the accretion shock, the UV lines may not be directly associated with the shock. On the other hand, studies of X-ray emission in young star clusters, suggest that the strength of the X-ray emission is correlated with stellar rotation, thus casting doubt on an accretion origin for the X-rays. We are beginning to access the infrared spectral region where the He I 108308Angstroms transition occurs. This line is particularly useful as a diagnostic of coronal radiation since it is formed by recombination following photoionization of neutral helium by coronal X-rays. Because the lower level of the transition is metastable, infrared radiation from the stellar photosphere is absorbed which provides a diagnostic of atmospheric dynamics. This transition is useful both in young stars in the T Tauri phase and in active cool star binaries. We will investigate the influence of coronal x-rays on the strength of this transition.
Author
Cool Stars; Stellar Coronas; Stellar Structure; X Ray Astronomy

20050192620 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Influence of Coronal Abundance Variations
Gurman, Joseph, Technical Monitor; DeLuca, Edward; May 2005; 2 pp.; In English
Contract(s)/Grant(s): NAG5-10872; No Copyright; Avail: CASI; A01, Hardcopy

During the final year of this program we concentrated on understanding the how to constrain the models with the best available observations. Work on developing accurate temperature and density diagnostics fkom TRACE and CDS together with constrained fits of non-potential force free fields will be extremely useful in the guiding the next generation of coronal models. The program has produced three fully operation numerical codes that model multi-species of ions in coronal loops: Static models and constant flow models. The time dependent numerical models have not been completed. We have extended the steady flow investigations to study the effect these flows have on coronal structure as observed with TRACE. Coronal

observations derive from heavy-ion emission; thus, we focus on the extent to which flow may modify coronal abundances by examining the heavy-ion abundance stratification within long-lived loops. We discuss the magnitudes of the physical effects modeled and compare simulated results with TRACE observations. These results can have a profound effect on the interpretation of TRACE observations.
Author
Abundance; Fluid Flow; Static Models; Coronal Loops

20050194728 Space Telescope Science Inst., Baltimore, MD, USA
Monitoring the Intrinsic Absorption Complex Toward RXJ123.8+0115
Sembach, Kenneth; July 15, 2005; 3 pp.; In English
Contract(s)/Grant(s): NNG04GH35G; STScI Proj. J1102; No Copyright; Avail: CASI; A01, Hardcopy

The main focus of this study was changed after it became clear that the object to be observed by the Far Ultraviolet Spectroscopic Explorer (FUSE) could not be observed because of spacecraft attitude control system limitations. Therefore, we replaced the prime object for the program (RXJ1230.8+0115) with a secondary object (H1821+643) and began an analysis of a similar quasar spectrum for comparison with the extant RXJ1230.8+0115 spectrum obtained previously by FUSE. Using high-resolution spectra of the radio-quiet, X-ray bright quasar HE0226-4110 obtained with the Hubble Space Telescope (HST) and FUSE, we have examined the remarkable associated absorption line system. The redshift of the quasar is roughly 0.5 so the FUSE+HST spectra cover the rest-frame wavelength in the extreme ultraviolet range 610-1 160A. In this range, we detect transitions from a wide range of ionization species, including the H I Lyman series, Ne VIII, and, for the first time at this resolution, four adjacent stages of oxygen O III-VI. The high quality of these spectra allow us to disentangle the structure of the gas using the complex kinematics to guide the assessments of the multi-component and multi-phase nature of the system. The kinematics of the absorber indicate that all the H I, C 111, and 0 III reside in a single component, while higher ionization species largely arise in a separate, more kinematically complex structure. An analysis of a ground-based spectrum of the quasar covering the H-beta and [0 III] 5007 emission lines reveal excellent agreement in redshift between the 0 III absorption and emission. Thus, for the first time, we are able to use absorption line diagnostics to place interesting constraints on the location and structure of the narrow emission line region around a quasar. In addition, we detect a narrow absorption line that is only seen O VI and lies roughly 50 km/s redward of the narrow emission line component. Absorption from 0 V, and Ne VIII is also detected at this velocity, but as part of broader, more redshifted, component. The line width of this narrow component imply a maximum temperature that is too small to produce O VI through collisional process, suggesting instead that photoionization from the quasar is the dominant ionization mechanism. The photoionization constraints imply that O VII should be the dominant ionization stage in the component.
Derived from text
Quasars; Absorption Spectra; Emission Spectra; Lyman Spectra; Line Spectra; X Ray Spectra; H Lines

20050196042 Naval Observatory, Washington, DC USA
Optically Identified BL Lacertae Objects From the Sloan Digital Sky Survey
Collinge, Matthew J.; Strauss, Michael A.; Hall, Patrick B.; Ivezic, Zeljko; Munn, Jeffrey A.; Schlegel, David J.; Zakamska, Nadia L.; Anderson, Scott F.; Harris, Hugh C.; Richards, Gordon T.; Schneider, Donald P.; Voges, Wolfgang; York, Donald G.; Margon, Bruce; Brinkmann, J.; Mar. 2005; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434857; No Copyright; Avail: Defense Technical Information Center (DTIC)

We present a sample of 386 BL Lacertae candidates identified from 2860 deg(exp 2) of the Sloan Digital Sky Survey (SDSS) spectroscopic database. The candidates are primarily selected to have quasi-featureless optical spectra and low proper motions as measured from SDSS and USNO-B positions; however, our ability to separate Galactic from extragalactic quasi-featureless objects (QFOs) on the basis of proper motion alone is limited by the lack of reliable proper motion measurements for faint objects. Fortunately, high proper motion QFOs, mostly DC white dwarfs, populate a well-defined region of color space, approximately corresponding to blackbodies with temperatures in the range 7000-12,000 K. QFOs with measurable redshifts or X-ray or radio counterparts (i.e., evidence of an extragalactic/ active galactic nucleus nature) loosely follow a track in color space that corresponds to power-law continua plus host galaxy starlight, with typical power-law slopes in the range 1\halpha(sub opt) \h 2 (fv varies as upsilon Z(exp -alpha)). Based largely on this remarkably clean color separation, we subdivide the sample into 240 probable candidates and 146 additional less probable (likely stellar) candidates. The probable BL Lac candidates have multiwavelength properties consistent with the range of previously known BL Lac objects, with an apparent preponderance of objects with synchrotron peaks at relatively high energies (HBL/XBL type). The majority of the 154 objects with measurable redshifts have z \h 1, with a median of 0.45; there are also a handful of high-redshift objects extending up to z = 5:03. We identify a small number of potential radio-quiet BL Lac candidates,

although more sensitive radio observations are needed to confirm their radio-quiet nature.
DTIC
Bl Lacertae Objects; Digital Systems; Sky; Sky Surveys (Astronomy); Surveys; Variable Stars; X Ray Spectra

20050196266 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Daytime Detection of Space Objects
Funge, Alistair D.; Mar. 2005; 106 pp.; In English; Original contains color illustrations
Report No.(s): AD-A435234; AFIT/GAP/ENG/05-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

Space Situational Awareness (SSA) requires repeated object updates for orbit accuracy. Detection of unknown objects is critical. A daytime model was developed that evaluated sun flares and assessed thermal emissions from space objects. Iridium satellites generate predictable sun glints. These were used as a model baseline for daytime detections. Flares and space object thermal emissions were examined for daytime detection. A variety of geometric, material and atmospheric characteristics affected this daytime detection capability. In a photon noise limited mode, simulated Iridium flares were detected. The peak Signal-to- Noise Ratios (SNR) were 6.05e18, 9.63e5, and 1.65e7 for the nighttime, daytime and infrared flares respectively. The thermal emission of space objects at 353K, 900K and 1300K with 2 to 20 m2 emitting areas were evaluated. The peak emission was for the 20 m2 900K object with an SNR of 1. 08e10. A number of barriers remain to be overcome if daytime detection of space objects can be achieved. While the above SNR values are large, this is based on optimal detection. The SBR's were less than 1 for all cases. Image post-processing will be necessary to extract the object from the background. Successful daytime detection techniques will increase sensor utilization times and improve SSA.
DTIC
Daytime; Detection

20050196626 Brown Univ., Providence, RI, USA
XMM-Newton Observations of the DLS Shear-Selected Cluster Survey
DellAntonio, Ian; July 19, 2005; 1 pp.; In English
Contract(s)/Grant(s): NAG5-13573; No Copyright; Avail: CASI; A01, Hardcopy

The goal of this project continues to be to test the selection effects in cluster surveys by investigating the X-ray properties of the first shear-selected sample of galaxy clusters, the Deep Lens Survey (DLS). Because lensing signal is only sensitive to mass (albeit with projection effects), lensing signal can be used to select a sample that is independent of its X-ray properties. If a lensing-selected sample has very different X-ray properties from an X-ray selected sample, it would have important consequences for evolutionary studies based on existing cluster samples was aimed at refining the lensing-selected sample as part of this continuing study The grant supported a KPNO run to obtain data on another region of the sky to extend the cluster sample, and also the purchase of a disk array for archiving the optical mosaic data (Two terabytes worth) from which the lensing maps are derived As a result of the grant, we have extended the lensing cluster sample to another 4-square degree patch of the sky, adding another three clusters to our sample to be observed While the sample of X-ray observed clusters is too small to derive a firm conclusion yet, our preliminary finding is that the X-ray properties of the observed sample do not differ from those of X-ray selected surveys A paper discussing the first results has been published, and a second paper on the mass differences is still in preparation (with J Hughes as first author)
Author
Galactic Clusters; X Rays; Mosaics; Lenses

20050196717 Gemini Observatory, USA
GeminiFocus: Newsletter of the Gemini Observatory, No. 25
Michaud, Peter, Editor; Roy, Jean-Rene, Editor; Petersen, Carolyn Collins, Editor; Johnson, Rachel, Editor; June 2005; 44 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

The articles in this issue include: 1) The Next Decade at Gemini Observatory; 2) Gemini Campaign Science; 3) Beta Pictoris with T-ReCS; 4) Accretion Signatures in Massive Stars; 5) Dust Emission from Massive-Star Supernova; 6); Key Problem in Stellar Evolution Tackled; 7) Did The Most Massive Galaxies Form First? 8) Recent Science Highlights Recent science results highlight galactic black holes, a planetary nebula, and a brown dwarf.
CASI
Astronomical Observatories; Astronomy; Space Observations (From Earth)

20050198881 Oregon Univ., OR, USA

Age Dating Merger Events in Early Type Galaxies via the Detection of AGB Light

Bothun, G.; [2005]; 7 pp.; In English

Contract(s)/Grant(s): NAG5-13077; No Copyright; Avail: CASI; A02, Hardcopy

A thorough statistical analysis of the J-H vs. H-K color plane of all detected early type galaxies in the 2MASS catalog with velocities less than 5000 km/s has been performed. This all sky survey is not sensitive to one particular galactic environment and therefore a representative range of early type galaxy environments have been sampled. Virtually all N-body simulation so major mergers produces a central starburst due to rapid collection of gas. This central starburst is of sufficient amplitude to change the stellar population in the central regions of the galaxy. Intermediate age populations are given away by the presence of AGB stars which will drive the central colors redder in H-K relative to the J- H baseline. This color anomaly has a lifetime of 2-5 billion years depending on the amplitude of the initial starburst Employing this technique on the entire 2MASS sample (several hundred galaxies) reveals that the AGB signature occurs less than 1% of the time. This is a straightforward indication that virtually all nearby early type galaxies have not had a major merger occur within the last few billion years.

Author

Sky Surveys (Astronomy); Starburst Galaxies; Statistical Analysis; Time Measurement; Chronology

20050198958 Pennsylvania State Univ., University Park, PA, USA

XMM-Newton Spectroscopy of the X-ray Detected Broad Absorption Line QSO CSO 755

Brandt, Niel; [2005]; 2 pp.; In English

Contract(s)/Grant(s): NAG5-9932; No Copyright; Avail: CASI; A01, Hardcopy

We present the results from XMM-Newton observations of the highly optically polarized broad absorption line quasar (BALQSO) CSO 755. By analyzing its X-ray spectrum with a total of approximately 3000 photons we find that this source has an X-ray continuum of 'typical' radio-quiet quasars, with a photon index of Gamma=1.83, and a rather flat (X-ray bright) intrinsic optical-to-X-ray spectral slope of alpha_ox=- 1.51. The source shows evidence for intrinsic absorption, and fitting the spectrum with a neutral-absorption model gives a column density of N_H approximately 1.2x10^22 cm^{-2}; this is among the lowest X-ray columns measured for BALQSOs. We do not detect, with high significance, any other absorption features in the X-ray spectrum. Upper limits we place on the rest-frame equivalent width of a neutral (ionized) Fe K-alpha line, less than =180 eV (less than =120 eV), and on the Compton-reflection component parameter, R less than =0.2, suggest that most of the X-rays from the source are directly observed rather than being scattered or reflected; this is also supported by the relatively flat intrinsic alpha ox we measure. The possibility that most of the X-ray flux is scattered due to the high level of UV-optical polarization is ruled out. Considering data for 46 BALQSOs from the literature, including CSO 755, we have found that the UV-optical continuum polarization level of BALQSOs is not correlated with any of their X-ray properties. A lack of significant short-term and long-term X-ray flux variations in the source may be attributed to a large black-hole mass in CSO 755. We note that another luminous BALQSO, PG 2112+059, has both similar shallow C IV BALs and moderate X-ray absorption.

Author

XMM-Newton Telescope; Spectroscopy; Detection; Absorption Spectra

20050198967 Yale Univ. Observatory, New Haven, CT, USA

The Secular Variations of the Orbital Elements of the Principal Planets

Brouwer, Dirk; VanWoerkom, A. J. J.; Astronomical Papers; 1950; Volume 13, Pt. 2, pp. 81-107; In English; No Copyright; Avail: CASI; A03, Hardcopy

The study of the secular variations of the elements of the principal planets contained in this publication was made in connection with a more comprehensive research project on the motions of the principal planets supported by the Office of Naval Research, and being carried out as a cooperative undertaking of the USA Naval Observatory, the Watson Scientific Computing Laboratory, and the Yale University Observatory. This particular study was made at the Yale Observatory. It was our intention to include in the solution the contributions to the secular variations due to Pluto. However, this problem has not yet yielded to our efforts. A method that appeared promising and for which we made elaborate calculations failed to remove the essential difficulty, the possible intersection of the orbits of Neptune and Pluto if the perihelia and nodes of these orbits are permitted to vary without restriction. This provisional negative result does not, in our opinion, indicate that no solution in the desired form is possible. In the meantime, the publication of our present results seemed desirable. It appears that the addition of Pluto to the system can best be treated as a modification of the solution now presented. The availability of our solution makes it possible at last to replace in applications the solution by Stockwell that is now almost 80 years old. The

principal insufficiency of Stockwell's solution is the large error in the period of the principal inequalities of the eccentricities and perihelia of Jupiter and Saturn. The only complete treatment of the problem made after Stockwell was that by P. Harzer in 1895. We have followed Harzer's method to a large extent. Unfortunately, the later sections of Harzer's work were seriously affected by an error that he himself discovered. In a sense, therefore, the present solution is a revision of Harzer's work. The authors are well aware of the mathematical limitations of the classical theory of the secular variations. Nevertheless, they are convinced that the theory, even with these limitations, has considerable value in the study of planetary motions.
Author (revised)
Secular Variations; Orbital Elements; Planet Ephemerides; Orbit Calculation; Solar Orbits; Planets

20050198968 Yale Univ. Observatory, New Haven, CT, USA
Star Catalog Corrections Determined from Observations of Selected Minor Planets
Pierce, David A.; Astronomical Papers; 1978; Volume 22, Pt. 3, pp. 207-360; In English; No Copyright; Avail: CASI; A08, Hardcopy

Corrections to the systematic errors in the zodiacal regions of the Yale Zone and Boss General star catalogs are determined from analyses of over 6800 photographic observations of 15 selected minor planets. The corrections, Delta alpha and Delta delta, are tabulated for small rectangular regions of the catalogs. The orbital elements of the minor planets have been determined from the observations. A discussion of other attempts to correct star catalogs using minor planet observations is included. The 6904 photographic positions (1935-1948) of the 15 minor planets are tabulated in the appendix.
Author
Astronomical Catalogs; Astronomical Photography; Correction; Systematic Errors; Asteroids

20050198969 Naval Observatory, Washington, DC, USA
Coordinates of the Center of Mass of the Sun and the Five Outer Planets: 1800-2060
Clemence, G. M.; Astronomical Papers; 1953; Volume 13, Pt. 4, pp. III- VIII and 323-363; In English; No Copyright; Avail: CASI; A03, Hardcopy

This Paper gives the heliocentric equatorial rectangular coordinates of the center of mass of the Sun (augmented by the masses of the four inner planets), Jupiter, Saturn, Uranus, Neptune, and Pluto, at 40-day intervals from 1800 to 2060, referred to the mean equinox and equator 1950.0. They were obtained from the data in Volume XII of these Papers, and are strictly consistent with them. Let the masses of Jupiter, Saturn, Uranus, Neptune, and Pluto, in units of the Sun's mass, be m(sub i), i=5, 6, 7, 8, 9; their heliocentric coordinates given in Volume XII, x(sub i), y(sub i), x(sub i); and the sum of the masses of the four inner planets, m(sub 0). The method of calculation was to evaluate for each date each of the five parts of z, y, z separately, by multiplying x(sub i), y(sub i), z(sub i) by the appropriate factors, retaining eleven decimals in the separate products but permitting errors of rounding up to two units of the eleventh decimal. The values of the coordinates and the differences required for interpolation are given on the following pages; the arrangement is identical with that of Volume XII. The first column gives the date in the Gregorian calendar; Universal Time is used on and after 1925 January 1 and astronomical dates beginning at Greenwich Mean Noon before. The second column gives the Julian Day and tenth, the tabular dates being for Greenwich Mean Midnight in all cases. The third, fourth, and fifth columns give the coordinates x, y, z and their second and fourth differences. Interpolation may be conveniently made with Everett's formula for central differences; tables of coefficients are given on pages XXXI and 327 of Volume XII.
Derived from text
Solar System; Center of Mass; Astronomical Coordinates; Sun; Jupiter (Planet); Saturn (Planet); Uranus (Planet); Neptune (Planet); Pluto (Planet); Planet Ephemerides; Cartesian Coordinates

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20050188785 Air Force Research Lab., Hanscom AFB, MA USA
Seasonal-Longitudinal Variability of Equatorial Plasma Bubbles
Burke, W. J.; Huang, C. Y.; Gentile, L. C.; Bauer, L.; Sep. 2004; 11 pp.; In English
Contract(s)/Grant(s): F19628-02-C-0012; Proj-2311
Report No.(s): AD-A434546; AFRL-VS-HA-TR-2005-1062; No Copyright; Avail: CASI; A03, Hardcopy

This study compared seasonal and longitudinal distributions of more than 8300 equatorial plasma bubbles (EPBs)

observed during a full solar cycle from 1989 to 2000 with predictions of two simple models. Both models are based on considerations of parameters that influence the linear growth rate of the generalized Rayleigh-Taylor instability in the context of finite windows of opportunity available during the prereversal enhancement near sunset. These parameters are the strength of the equatorial magnetic field, B(sub eq), and the angle, alpha, it makes with the dusk terminator line. The independence of alpha and B(sub eq) from the solar cycle phase justifies the comparisons.
DTIC
Annual Variations; Bubbles; Equatorial Regions; Ionospheres; Magnetohydrodynamic Stability; Plasma Bubbles; Solar Cycles

20050188834 Naval Observatory, Washington, DC USA
Axial Symmetry and Rotation in the SiO Maser Shell of IK Tauri
Boboltz, D. A.; Diamond, P. J.; Feb. 2005; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A434683; No Copyright; Avail: Defense Technical Information Center (DTIC)

We observed v is equal 1, J equals 1-0 43 GHz SiO maser emission toward the Mira variable IK Tauri (IK Tau) using the Very Long Baseline Array (VLBA). The images resulting from these observations show that SiO masers form a highly elliptical ring of emission approximately 58 x32 mas with an axial ratio of 1. 8:1. The major axis of this elliptical distribution is oriented at a position angle of approximately 59 deg. The line-of-sight velocity structure of the SiO masers has an apparent axis of symmetry consistent with the elongation axis of the maser distribution. Relative to the assumed stellar velocity of 35 kms 1, the blue- and redshifted masers were found to lie to the northwest and southeast of this symmetry axis, respectively. This velocity structure suggests a northwest southeast (NW SE) rotation of the SiO maser shell with an equatorial velocity, which we determine to be approximately 3.6 km s (exp-1). Such a NW SE rotation is in agreement with a circumstellar envelope geometry invoked to explain previous H2O and OH maser observations. In this geometry, H2O and OH masers are preferentially created in a region of enhanced density along the NE SW equator orthogonal to the rotation/polar axis suggested by the SiO maser velocities.
DTIC
Masers; Rotation; Symmetry; Taurus Constellation

20050192564 Lawrence Livermore National Lab., Livermore, CA USA
Comparison of Three Afterglow Morphologies
Salmonson, J. D.; Rossi, E.; Lazzati, D.; Dec. 24, 2003; 10 pp.; In English
Report No.(s): DE2005-15013654; UCRL-CONF-201612; No Copyright; Avail: Department of Energy Information Bridge

Herein we compare three functional families for afterglow morphologies: the homogeneous afterglow with constant shock surface energy density, the structured afterglow for which the energy density decays as a power-law as a function of viewer angle, and the gaussian afterglow which has an exponential decay of energy density with viewer angle. We simulate observed lightcurves and polarization curves for each as seen from a variety of observer vantage points. We find that the homogeneous jet is likely inconsistent with observations and suggest that the future debate on the structure of afterglow jets will be between the other two candidates.
NTIS
Afterglows; Morphology

20050192582 Space Telescope Science Inst., Baltimore, MD, USA
Outbursts in Symbiotic Binaries
Sonneborn, George, Technical Monitor; Keyes, Charles; July 15, 2005; 3 pp.; In English
Contract(s)/Grant(s): NAG5-11208; STScI Proj. J0349; No Copyright; Avail: CASI; A01, Hardcopy

A major question for symbiotic stars concerns the nature and cause of their outbursts. A small subset of symbiotics, the slow novae are fairly well established as thermonuclear events that last on the order of decades. The several symbiotic recurrent novae, which are much shorter and last on the order of months, are also thought to be thermonuclear runaways. Yet the majority of symbiotics are neither slow novae nor recurrent novae. These are the so-called classical symbiotics, many of which show outbursts whose cause is not well understood. In some cases, jets are produced in association with an outburst, therefore an investigation into the causes of outbursts will yield important insights into the production of collimated outflows. To investigate the cause and nature of classical symbiotic outbursts, we initiated a program of multiwavelength observations of these events. In FUSE Cycle 2, we obtained six observational epochs of the 2000-2002 classic symbiotic outburst in the first target of our campaign - class prototype, Z Andromedae. That program was part of a coordinated multi-wavelength

Target-of-Opportunity (TOO) campaign with FUSE, XMM, Chandra, MERLIN, the VLA, and ground-based spectroscopic and high time-resolution photometric observations. Our campaign proved the concept, utility, and need for coordinated multi-wavelength observations in order to make progress in understanding the nature of the outburst mechanisms in symbiotic stars. Indeed, the FUSE data were the cornerstone of this project
Derived from text
Symbiotic Stars; Novae; Binary Stars

20050194616 Lawrence Livermore National Lab., Livermore, CA USA
Kinematics of the Lag-Luminosity Relationship
Salmonson, J. D.; Dec. 01, 2002; 10 pp.; In English
Report No.(s): DE2005-15013857; UCRL-CONF-202979; No Copyright; Avail: Department of Energy Information Bridge
Herein the author reviews the argument that kinematics, i.e. relativistic motions of the emitting source in gamma-ray bursts (GRBs), are the cause of the lag-luminosity relationship observed in bursts with known redshifts.
NTIS
Luminosity; Kinematics

20050194650 Lawrence Livermore National Lab., Livermore, CA USA
Is the Short Distance Scale a Result of a Problem with the LMC Photometric Zero Point
Popowski, P.; Mar. 30, 2004; 10 pp.; In English
Report No.(s): DE2005-15014055; UCRL-CONF-203267; No Copyright; Avail: Department of Energy Information Bridge
The essence of the approach presented here is a comparison between clump giants and RR Lyrae stars in different environments. If answers from two distance indicators agree then either systematics have been reduced to negligible levels in both of them or biases conspire to produce the same answer. This last problem can be tested with an attempt to synchronize distance scales in three different environments, because a conspiracy of systematic errors is not likely to repeat in all environments. Here I show that combining the information on RR Lyrae and clump stars in the solar neighborhood. Galactic bulge, and Large Magellanic Cloud (LMC) provides additional constraints on the local distance scale.
NTIS
Magellanic Clouds; Photometry; Distance Measuring Equipment; Galactic Bulge

20050194654 Lawrence Livermore National Lab., Livermore, CA USA
Integrated Universal Collapsar Gamma-ray Burst Model
Salmonson, J. D.; Jan. 22, 2004; 12 pp.; In English
Report No.(s): DE2005-15013982; UCRL-CONF-201944; No Copyright; Avail: Department of Energy Information Bridge
Starting with two assumptions: (1) gamma-ray bursts originate from stellar death phenomena or so called 'collapsars' and (2) that these bursts are quasi-universal, whereby the majority of the observed variation is due to our perspective of the jet, an integrated gamma-ray burst model is proposed. It is found that several of the key correlations in the data can be naturally explained with this simple picture and another possible correlation is predicted.
NTIS
Astronomical Models; Gamma Ray Bursts; Universe

20050196095 Air Force Research Lab., Hanscom AFB, MA USA
Sunspot Cycle 24: Smallest Cycle in 100 Years?
Svalgaard, Leif; Cliver, Edward W.; Kamide, Yohsuke; Jan. 2005; 5 pp.; In English
Contract(s)/Grant(s): Proj-1010
Report No.(s): AD-A434948; AFRL-VS-HA-TR-2005-1075; No Copyright; Avail: CASI; A01, Hardcopy
Predicting the peak amplitude of the sunspot cycle is a key goal of solar-terrestrial physics. The precursor method currently favored for such predictions is based on the dynamo model in which large-scale polar fields on the decline of the 11-year solar cycle are converted to toroidal (sunspot) fields during the subsequent cycle. The strength of the polar fields during the decay of one cycle is assumed to be an indicator of peak sunspot activity for the following cycle. Polar fields reach their peak amplitude several years after sunspot maximum; the time of peak strength is signaled by the onset of a strong annual modulation of polar fields due to the 7 1/4-degree tilt of the solar equator to the ecliptic plane. Using direct polar field measurements, now available for four solar cycles, the authors predict that the approaching solar cycle 24 (approx. 2011

maximum) will have a peak smoothed monthly sunspot number of 75 +/- 8, making it potentially the smallest cycle in the last 100 years.
DTIC
Magnetic Fields; Polar Regions; Solar Cycles; Solar Magnetic Field; Sun; Sunspot Cycle; Sunspots

20050196655 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
The Evolution of CTB-109
Plucinsky, Paul; Mushotsky, Richard, Technical Monitor; July 2005; 2 pp.; In English
Contract(s)/Grant(s): NAG5-9914; No Copyright; Avail: CASI; A01, Hardcopy

The objectives of the proposal were to conduct spatially-resolved spectroscopy in order to constrain the evolutionary parameters of the supernova remnant (SNR) and to understand the nature of the emission from a bright central feature. We were very successful on both accounts. of the SNR to be t = 8.8 +/- 0.9 x l0(exp 3) yr, the initial explosion energy to be E(sub 0) = 7.4 +/- 2. x l0(exp 5) ergs, and the initial ambient density to be n(sub 0) = 0.16 +/- 0.02/ cc, assuming a distance of 3.0 kpc. central emission is completely thermal in nature and therefore most likely the result of a shock-cloud interaction. Our analysis also produces the deepest X-ray image yet acquired of this SNR and the data were used to produce a 'true-color' X-ray image of the object. Our complete results are contained in the Astrophysical Journal paper referenced above.
Author
Spectroscopy; Supernova Remnants; Shock Wave Interaction

20050196800 Lawrence Livermore National Lab., Livermore, CA USA
Effects of Initial Conditions on Compressible Mixing in Supernova-Relevant Laboratory Experiments
Miles, A. R.; Edwards, M. J.; Greenough, J. A.; May 03, 2004; 22 pp.; In English
Report No.(s): DE2005-15014230; UCRL-PROC-203919; No Copyright; Avail: Department of Energy Information Bridge

In this paper, we summarize recent results from our computational study of unstable systems driven by high Mach number shock and blast waves. For planar multimode systems, compressibility effects preclude the emergence of a regime of self-similar instability growth independent of the initial conditions (ICs) by allowing for memory of the initial conditions to be retained in the mix-width at all times. With higher-dimensional blast waves, divergence restores the properties necessary for establishment of the self-similar state, but achieving it requires very high initial characteristic mode number and high Mach number for the incident blast wave.
NTIS
Supernovae; Detonation Waves

20050198891 Colorado Univ., Boulder, CO, USA
New Techniques for the Next Far Ultraviolet Spectroscopic Mission
Green, James C.; Wilkinson, Erik; [2005]; 5 pp.; In English
Contract(s)/Grant(s): NAG5-9092; No Copyright; Avail: CASI; A01, Hardcopy

The Far Ultraviolet Spectroscopic Explorer (FUSE) has been a great success, and has addressed many critical scientific questions (Moos, et al, 2000). However, it has also highlighted the need for even more powerful instrumentation in the 900-1200 A, regime. In particular, significantly increased effective area will permit the pursuit of additional scientific programs currently impractical or impossible with FUSE. It is unlikely that FUSE will last more than a few more years. Nor is it likely that any large scale UV-optical follow-on to HST (such as SUVO) will include the 900-1200 A, bandpass. However, FUSE remains well oversubscribed and continues to perform excellent science. Therefore, a MIDEX class mission in the next 4-6 years that could significantly improve on the FUSE capabilities would be a powerful scientific tool that would be of great utility to the astronomical community. It would open up new scientific programs if it can improve on the sensitivity of FUSE by an order of magnitude. We have identified a powerful technique for efficient, high-resolution spectroscopy in the FUV (and possibly the EUV) that may provide exactly what is needed for such a mission To achieve a factor of 10 improvement in effective area, we propose using a large (meter class), low-cost, grazing incidence metal optics. This would produced in a manner similar to the EUVE mirrors (Green, et al, 1986), using diamond turning to create the optical figure followed by uncontrolled polishing to achieve a high quality surface. This process will introduce significant figure errors that will degrade the image quality. However, if a holographic grating is employed, which has utilized the actual telescope in the recording geometry, all wavefront errors will be automatically corrected in the end-to-end spectrometer, and high quality spectroscopy

will be possible with low quality (and low-cost) optics. In this way a MIDEX class FUSE can be proposed with 10 times the effective area of the current instrument.
Author
Far UV Spectroscopic Explorer; Extreme Ultraviolet Explorer Satellite; Far Ultraviolet Radiation; Grazing Incidence

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20050194571 NASA Glenn Research Center, Cleveland, OH, USA
Solar Power System Evaluated for the Human Exploration of Mars
Kerslake, Thomas W.; Research and Technology 1999; March 2000; 3 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The electric power system is a crucial element of any mission for the human exploration of the Martian surface. The bulk of the power generated will be delivered to crew life support systems, extravehicular activity suits, robotic vehicles, and predeployed in situ resource utilization (ISRU) equipment. In one mission scenario, before the crew departs for Mars, the ISRU plant operates for 435 days producing liquefied methane and oxygen for ascent-stage propellants and water for crew life support. About 200 days after ISRU production is completed, the crew arrives for a 500-day surface stay. In this scenario, the power system must operate for a total of 1130 days (equivalent to 1100 Martian 'sols'), providing 400 MW-hr of energy to the ISRU plant and up to 18 kW of daytime user power. A photovoltaic power-generation system with regenerative fuel cell (RFC) energy storage has been under study at the NASA Glenn Research Center at Lewis Field. The conceptual power system is dominated by the 4000- m2 class photovoltaic array that is deployed orthogonally as four tent structures, each approximately 5 m on a side and 100-m long. The structures are composed of composite members deployed by an articulating mast, an inflatable boom, or rover vehicles, and are subsequently anchored to the ground. Array panels consist of thin polymer membranes with thin-film solar cells. The array is divided into eight independent electrical sections with solar cell strings operating at 600 V. Energy storage is provided by regenerative fuel cells based on hydrogen-oxygen proton exchange membrane technology. Hydrogen and oxygen reactants are stored in gaseous form at 3000 psi, and the water produced is stored at 14.7 psi. The fuel cell operating temperature is maintained by a 40-m2 deployable pumped-fluid loop radiator that uses water as the working fluid. The power management and distribution (PMAD) architecture features eight independent, regulated 600-Vdc channels. Power management and distribution power cables use various gauges of copper conductors with ethylene tetrafluoroethylene insulation. To assess power system design options and sizing, we developed a dedicated Fortran code to predict detailed power system performance and estimate system mass. This code also modeled the requisite Mars surface environments: solar insolation, Sun angles, dust storms, dust deposition, and thermal and ultraviolet radiation. Using this code, trade studies were performed to assess performance and mass sensitivities to power system design parameters (photovoltaic array geometry and orientation) and mission parameters (landing date and landing site latitude, terrain slope, and dust storm activity). Mission analysis cases were also run. Power results are shown in this graph for an analysis case with a September 1, 2012, landing date; 18.95 North latitude landing site; two seasonal dusts storms; and tent arrays. To meet user load requirements and the ISRU energy requirement, an 8-metric ton (MT) power system and 4000-m2 photovoltaic array area were required for the assumed advanced CuInS2 thin-film solar cell technology. In this figure, the top curve is the average daytime photovoltaic array power, the middle curve is average daytime user load power, and the bottom curve is nighttime power. At mission day 1, daytime user power exceeds 120 kW before falling off to 80 kW at the end of the mission. Throughout the mission, nighttime user power is set to the nighttime power requirement. In this analysis, 'nighttime' is defined as the 13- to 15-hr period when array power output is below the daytime power requirement. During dust storms, power system capability falls off dramatically so that by mission day 900, a daily energy balance cannot be maintained. Under these conditions, the ISRU plant is placed in standby mode, and the regenerative fuel cell energy storage is gradually discharged to meet user loads.
Author (revised)
Mars Surface; Mars Exploration; Solar Generators; Manned Mars Missions

20050194678 Lawrence Livermore National Lab., Livermore, CA USA
Characterization of Adaptive Optics at Keck Observatory: Part II
van Dam, M. A.; Le Mignant, D.; Macintosh, B. A.; Jun. 09, 2004; 18 pp.; In English
Report No.(s): DE2005-15014204; UCRL-PROC-204572; No Copyright; Avail: Department of Energy Information Bridge

Adaptive optics (AO) has found widespread use in astronomical settings to compensate for atmospheric turbulence and telescope aberrations. At the W. M. Keck Observatory, there are identical adaptive optics systems on the Keck I and Keck II telescopes. In previous work, we described the components and the performance of the Keck AO system. This paper is a continuation of this characterization eort. In this paper, we focus on the problem of estimating the bandwidth and measurement noise errors. This is important because during an AO observation these are the only two terms that can be optimized to improve the performance.
NTIS
Adaptive Optics; Astronomical Observatories

20050196566 Ohio Aerospace Inst., OH, USA, NASA Glenn Research Center, Cleveland, OH, USA
Mars Array Technology Experiment Developed to Test Solar Arrays on Mars
Landis, Geoffrey A.; Research and Technology 2000; March 2001; 2 pp.; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

Solar arrays will be the power supply for future missions to the planet Mars, including landers, rovers, and eventually human missions to explore the Martian surface. Until Mars Pathfinder landed in July 1997, no solar array had been used on the surface. The MATE package is intended to measure the solar energy reaching the surface, characterize the Martian environment to gather the baseline information required for designing power systems for long-duration missions, and to quantify the performance and degradation of advanced solar cells on the Martian surface. To measure the properties of sunlight reaching the Martian surface, MATE incorporates two radiometers and a visible/NIR spectrometer. The radiometers consist of multiple thermocouple junctions using thin-film technology. These devices generate a voltage proportional to the solar intensity. One radiometer measures the global broadband solar intensity, including both the direct and scattered sunlight, with a field of view of approximately 130. The second radiometer incorporates a slit to measure the direct (unscattered) intensity radiation. The direct radiometer can only be read once per day, with the Sun passing over the slit. The spectrometer measures the global solar spectrum with two 256-element photodiode arrays, one Si sensitive in the visible range (300 to 1100 nm), and a second InGaAs sensitive to the near infrared (900 to 1700 nm). This range covers 86 percent of the total energy from the Sun, with approximately 5-nm resolution. Each photodiode array has its own fiber-optic feed and grating. Although the purpose of the MATE is to gather data useful in designing solar arrays for Mars surface power systems, the radiometer and spectrometer measurements are expected to also provide important scientific data for characterizing the properties of suspended atmospheric dust. In addition to measuring the solar environment of Mars, MATE will measure the performance of five different individual solar cell types and two different solar cell strings, to qualify advanced solar cell types for future Mars missions. The MATE instrument, designed for the Mars-2001 Surveyor Lander mission, contains a capable suite of sensors that will provide both scientific information as well as important engineering data on the operation of solar power systems on Mars. MATE will characterize the intensity and spectrum of the solar radiation on Mars and measure the performance of solar arrays in the Mars environment. MATE flight hardware was built and tested at the NASA Glenn Research Center and is ready for flight.
Author
Mars Surface; Solar Arrays; Technology Utilization; Solar Energy; Spaceborne Experiments

20050196664 Colorado Univ., Boulder, CO, USA
Astrobiological and Geological Implications of Convective Transport in Icy Outer Planet Satellites
Pappalardo, Robert T.; Zhong, Shi-Jie; Barr, Amy; [2005]; 3 pp.; In English
Contract(s)/Grant(s): NCC2-1340; No Copyright; Avail: CASI; A01, Hardcopy

The oceans of large icy outer planet satellites are prime targets in the search for extraterrestrial life in our solar system. The goal of our project has been to develop models of ice convection in order to understand convection as an astrobiologically relevant transport mechanism within icy satellites, especially Europa. These models provide valuable constraints on modes of surface deformation and thus the implications of satellite surface geology for astrobiology, and for planetary protection. Over the term of this project, significant progress has been made in three areas: (1) the initiation of convection in large icy satellites, which we find probably requires tidal heating; (2) the relationship of surface features on Europa to internal ice convection, including the likely role of low-melting-temperature impurities; and (3) the effectiveness of convection as an agent of icy satellite surface-ocean material exchange, which seems most plausible if tidal heating, compositional buoyancy, and solid-state convection work in combination. Descriptions of associated publications include: 3 published papers (including contributions to 1 review chapter), 1 manuscript in revision, 1 manuscript in preparation (currently being completed under separate funding),

and 1 published popular article. A myriad of conference abstracts have also been published, and only those from the past year are listed.
Derived from text
Convective Flow; Buoyancy; Ice; Icy Satellites; Satellite Surfaces; Tides; Convection

20050196685 Colorado Univ., Boulder, CO, USA
Convective Instability in Ice I with Non-Newtonian Rheology: Application to the Galilean Satellites
Barr, A. C.; Zhong, S.; Pappalardo, R. T.; Journal of Geophysical Research; 2004; Volume 109; 2 pp.; In English
Contract(s)/Grant(s): NCC2-1340; No Copyright; Avail: Other Sources; Abstract Only

At the temperatures and stresses associated with the onset of convection in an ice I shell of the Galilean satellites, ice behaves as a non-Newtonian fluid with a viscosity that depends on both temperature and strain rate. The convective stability of a non-Newtonian ice shell can be judged by comparing the Rayleigh number of the shell to a critical value. Previous studies suggest that the critical Rayleigh number for a non-Newtonian fluid depends on the initial conditions in the fluid layer, in addition to the thermal, rheological, and physical properties of the fluid. We seek to extend the existing definition of the critical Rayleigh number for a non-Newtonian, basally heated fluid by quantifying the conditions required to initiate convection in an ice I layer initially in conductive equilibrium. We find that the critical Rayleigh number for the onset of convection in ice I varies as a power (-0.6 to -0.5) of the amplitude of the initial temperature perturbation issued to the layer, when the amplitude of perturbation is less than the rheological temperature scale. For larger-amplitude perturbations, the critical Rayleigh number achieves a constant value. We characterize the critical Rayleigh number as a function of surface temperature of the satellite, melting temperature of ice, and rheological parameters so that our results may be extrapolated for use with other rheologies and for a generic large icy satellite. The values of critical Rayleigh number imply that triggering convection from a conductive equilibrium in a pure ice shell less than 100 km thick in Europa, Ganymede, or Callisto requires a large, localized temperature perturbation of a few kelvins to tens of kelvins to soften the ice and therefore may require tidal dissipation in the ice shell.
Author
Galilean Satellites; Rayleigh Number; Rheology; Nonnewtonian Fluids; Convective Flow; Icy Satellites; Ice

20050196686 Colorado Univ., Boulder, CO, USA
Origin of Domes on Europa: The Role of Thermally Induced Compositional Buoyancy,
Pappalardo, R. T.; Barr, A. C.; Geophysical Research Letters; 2004; Volume 31; 1 pp.; In English
Contract(s)/Grant(s): NCC2-1340; No Copyright; Avail: Other Sources; Abstract Only

The surface of Jupiter's moon Europa is peppered by topographic domes, interpreted as sites of intrusion and extrusion. Diapirism is consistent with dome morphology, but thermal buoyancy alone cannot produce sufficient driving pressures to create the observed dome elevations. Instead, diapirs may initiate by thermal convection that induces compositional segregation. Exclusion of impurities from warm upwellings allows sufficient buoyancy for icy plumes to create the observed surface topography, provided the ice shell has a small effective elastic thickness (0.2 to 0.5 km) and contains low-eutectic point impurities at the few percent level. This model suggests that the ice shell may be depleted in impurities over time.
Author
Buoyancy; Europa; Morphology; Free Convection; Topography; Temperature Effects; Impurities; Intrusion; Extruding

20050196687 Colorado Univ., Boulder, CO, USA
Geology of Europa
Greeley, R.; Chyba, C.; Head, J. W.; McCord, T.; McKinnon, W. B.; Pappalardo, R. T.; Jupiter: The Planet, Satellites and Magnetosphere; 2004, pp. 329-362; In English
Contract(s)/Grant(s): NCC2-1340; No Copyright; Avail: Other Sources; Abstract Only

Europa is a rocky object of radius 1565 km (slightly smaller than Earth s moon) and has an outer shell of water composition estimated to be of order 100 km thick, the surface of which is frozen. The total volume of water is about 3 x 10(exp 9) cubic kilometers, or twice the amount of water on Earth. Moreover, like its neighbor Io, Europa experiences internal heating generated from tidal flexing during its eccentric orbit around Jupiter. This raises the possibility that some of the water beneath the icy crust is liquid. The proportion of rock to ice, the generation of internal heat, and the possibility of liquid water make Europa unique in the Solar System. In this chapter, we outline the sources of data available for Europa (with a focus on the Galileo mission), review previous and on-going research on its surface geology, discuss the astrobiological potential of Europa, and consider plans for future exploration.
Author
Europa; Exobiology; Planetary Geology; Satellite Atmospheres; Planetary Magnetospheres; Jupiter (Planet)

20050198875 NASA Glenn Research Center, Cleveland, OH, USA
Let's Orbit Mars: A Proposal to Explore Mars Now
Landis, Geoffrey A.; [2004]; 13 pp.; In English
Contract(s)/Grant(s): WBS 22-390-30-20
Report No.(s): E-14865; No Copyright; Avail: CASI; A03, Hardcopy

Mars is an exciting target for the human exploration; the next destination toward the ultimate human colonization of the solar system. But the price of proposed missions to Mars is a daunting barrier. Expensive missions make it a slow and difficult process to achieve the political consensus to make a commitment to exploration. In today's deficit-conscious era (and what era is not?), it is as difficult-- perhaps impossible-- task to justify to a skeptical and cost-conscious public the need to invest in exploration. It seems far too easy to postpone exploration into a future that never seems to arrive. It would be terrific to explore Mars in small steps, where each step makes progress toward human exploration and settlement, and each step also is not only exciting to the public, but also justifiable on its own scientific merits.
Author
Mars Missions; Mars Exploration; Solar System

20050198956 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Voyage of Exploration and Discovery: Earth-Moon, Mars and Beyond
Esper, Jaime; March 2005; 36 pp.; In English; IEEE Aerospace and Electronic Systems Society, USA; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph is a printout of a presentation which originally contained multimedia components. The presentation summarizes the accomplishments of the Cassini-Huygens mission, with numerous images and video clips of Saturn, its rings, and its moons. The presentation also summarizes a feasibility analysis of the Neptune-Triton Explorer (NExTEP).
CASI
Cassini Mission; Huygens Probe; Feasibility Analysis; Space Missions; Neptune (Planet); Multimedia; Saturn (Planet)

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20050192469 NASA Goddard Space Flight Center, Greenbelt, MD, USA
New Data on the Topside Electron Density Distribution
Huang, Xue-Qin; Reinisch, Bodo; Bilitza, Dieter; Benson, Robert F.; [2001]; 6 pp.; In English; Boston Beacon Satellite Symposium 2001, 2001, USA; Original contains color illustrations
Contract(s)/Grant(s): NAG5-8145; RTOP 370-03-00-04; No Copyright; Avail: CASI; A02, Hardcopy

The existing uncertainties about the electron density profiles in the topside ionosphere, i.e., in the height region from hmF2 to approx. 2000 km, require the search for new data sources. The ISIS and Alouette topside sounder satellites from the sixties to the eighties recorded millions of ionograms and most were not analyzed in terms of electron density profiles. In recent years an effort started to digitize the analog recordings to prepare the ionograms for computerized analysis. As of November 2001 about 350,000 ionograms have been digitized from the original 7-track analog tapes. These data are available in binary and CDF format from the anonymous ftp site of the National Space Science Data Center. A search site and browse capabilities on CDAWeb assist the scientific usage of these data. All information and access links can be found at http://nssdc.gsfc.nasa.gov/space/isis/isis-status.html. This paper describes the ISIS data restoration effort and shows how the digital ionograms are automatically processed into electron density profiles from satellite orbit altitude (1400 km for ISIS-2) down to the F peak. Because of the large volume of data an automated processing algorithm is imperative. The automatic topside ionogram scaler with true height algorithm TOPIST software developed for this task is successfully scaling approx.70 % of the ionograms. An 'editing process' is available to manually scale the more difficult ionograms. The automated processing of the digitized ISIS ionograms is now underway, producing a much-needed database of topside electron density profiles for ionospheric modeling covering more than one solar cycle. The ISIS data restoration efforts are supported through NASA's Applied Systems and Information Research Program.
Author
Electron Density (Concentration); Density Distribution; Ionograms; Computer Techniques; Electron Density Profiles; Isis Satellites

20050192640 Stanford Univ., Stanford, CA, USA

Studies of Particle Acceleration, Transport and Radiation in Impulsive Phase of Solar Flares

Petrosian, Vahe; [2005]; 6 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG5-11918; No Copyright; Avail: CASI; A02, Hardcopy

Solar activity and its most prominent aspect, the solar flares, have considerable influence on terrestrial and space weather. Solar flares also provide a suitable laboratory for the investigation of many plasma and high energy processes important in the magnetosphere of the Earth and many other space and astrophysical situations. Hence, progress in understanding of flares will have considerable scientific and societal impact. The primary goal of this grant is the understanding of two of the most important problems of solar flare physics, namely the determination of the energy release mechanism and how this energy accelerates particles. This is done through comparison of the observations with theoretical models, starting from observations and gradually proceeding to theoretically more complex situations as the lower foundations of our understanding are secured. It is generally agreed that the source of the flare energy is the annihilation of magnetic fields by the reconnection process. Exactly how this energy is released or how it is dissipated remains controversial. Moreover, the exact mechanism of the acceleration of the particles is still a matter of debate. Data from many spacecrafts and ground based instruments obtained over the past decades have given us some clues. Theoretical analyses of these data have led to the standard thick target model (STT) where most of the released energy goes into an (assumed) power law spectrum of accelerated particles, and where all the observed radiations are the consequence of the interaction of these particles with the flare plasma. However, some theoretical arguments, and more importantly some new observations, have led us to believe that the above picture is not complete. It appears that plasma turbulence plays a more prominent role than suspected previously, and that it is the most likely agent for accelerating particles. The model we have developed is based on production of a high level of plasma waves and turbulence in the reconnection region above a flare loop. This turbulence accelerates particles stochastically which radiate some of their energy in this region but carry most of their energy to the footpoints of the loop, where they lose all their energy and radiate bulk of the observed radiation as in the traditional thick target model. In the past we have worked on various aspects of this model. We have evaluated the interaction rates of the plasma waves with electrons and ions, developed theoretical frameworks for the acceleration, transport and radiative processes, and produced numerical codes for the investigation of these processes. The goal of this grant has been further development and testing of this new paradigm, with emphases on the relative acceleration of electrons and ions and on a comprehensive investigation of the turbulence generation, cascade, and damping processes. We review several pieces of important evidence that we have uncovered indicating the crucial roles of turbulence, in and we describe accomplishments during the past two years of this grant.

Derived from text

Particle Acceleration; Solar Flares; Radiation; Astrophysics; Solar Activity

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20050192471 NASA Langley Research Center, Hampton, VA, USA

Engineering Effort Needed to Design Spacecraft with Radiation Constraints

Singleterry, Robert C., Jr.; [2005]; 11 pp.; In English; Space Nuclear Conference 2005, 5-9 Jun. 2005, San Diego, CA, USA; Original contains black and white illustrations

Contract(s)/Grant(s): 23-090-50-40

Report No.(s): Paper 1063; No Copyright; Avail: CASI; A03, Hardcopy

A roadmap is articulated that describes what is needed to allow designers, to include researchers, management, and engineers, to investigate, design, build, test, and fly spacecraft that meet the mission requirements yet, be as low cost as possible. This roadmap describes seven levels of tool fidelity and application: 1) Mission Speculation, 2) Management Overview, 3) Mission Design, 4) Detailed Design, 5) Simulation and Training, 6) Operations, and 7) Research. The interfaces and output are described in top-level detail along with the transport engines needed, and deficiencies are noted. This roadmap, if implemented, will allow Multidisciplinary Optimization (MDO) ideas to incorporate radiation concerns. Also, as NASA moves towards Simulation Based Acquisition (SBA), these tools will facilitate the appropriate spending of government money. Most of the tools needed to serve these levels do not exist or exist in pieces and need to be integrated to create the tool.

Author

Spacecraft Design; Extraterrestrial Radiation; Radiation Effects; Design Analysis; Space Environment Simulation

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20050192497 NASA, Washington, DC, USA
Risk and Exploration: Earth, Sea and Stars
Dick, Steven J., Editor; Cowing, Keith L., Editor; [2005]; 308 pp.; In English; Risk and Exploration: Earth, Sea and Stars, 26-29 Sep. 2004, Monterey, CA, USA; Original contains color and black and white illustrations
Report No.(s): NASA/SP-2005-4701; LC-2005004470; No Copyright; Avail: CASI; EA4, Hardcopy

The NASA History Division is pleased to present the record of a unique meeting on risk and exploration held under the auspices of the NASA Administrator, Sean O Keefe, at the Naval Postgraduate School in Monterey, California, from September 26-29, 2004. The meeting was the brainchild of Keith Cowing and astronaut John Grunsfeld, NASA's chief scientist at the time. Its goals, stated in the letter of invitation published herein, were precipitated by the ongoing dialogue on risk and exploration in the wake of the Columbia Shuttle accident, the Hubble Space Telescope servicing question, and, in a broader sense, by the many NASA programs that inevitably involve a balance between risk and forward-looking exploration. The meeting, extraordinarily broad in scope and participant experience, offers insights on why we explore, how to balance risk and exploration, how different groups defi ne and perceive risk differently, and the importance of exploration to a creative society. At NASA Headquarters, Bob Jacobs, Trish Pengra, and Joanna Adamus of NASA Public Affairs led the meeting's implementation. The Naval Postgraduate School, commanded by Rear Admiral Patrick W. Dunne, provided a congenial venue. The meeting was broadcast on NASA TV, and thanks are due in this regard to Al Feinberg, Tony Stewart, Jim Taylor, and the planners collaborative: Mark Shaddock and Spotlight Productions, Donovan Gates of Donovan Gates Production, and Michael Ditertay and his staff on this 30-person television crew. Thanks to their efforts, a DVD record of the meeting has also been produced. Thanks are also due to the moderators: Miles O Brien of CNN, Chris McKay of NASA Ames, David Halpern of the White House Office of Science and Technology Policy, and John Grunsfeld, NASA Headquarters. In order to maintain the informal flavor of the meetings, these proceedings are based on transcripts that have been lightly edited for grammar and punctuation. Most references to slides shown during the presentations have been deleted.
Author (revised)
Conferences; Histories; NASA Programs; Risk; Exploration; Motivation

20050198896 NASA Dryden Flight Research Center, Edwards, CA, USA
2003 Research Engineering Annual Report
Stoliker, Patrick C., Compiler; Flick, Brad, Compiler; Cruciani, Everlyn, Compiler; July 25, 2005; 98 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2005-212874; H-2582; No Copyright; Avail: CASI; A05, Hardcopy

Selected research and technology activities at Dryden Flight Research Center are summarized. These activities exemplify the Center's varied and productive research efforts.
Author
Aerodynamics; Control Systems Design; Flight Control; Flight Test Instruments

Subject Term Index

PATTERN RECOGNITION

SAFETY

SAILS

SAMPLING

SANDWICH STRUCTURES

Personal Author Index