

Aircraft Wiring Service History

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Overview

- Major wiring related accidents
 - TWA 800
 - Swissair 111
- Large Transport Incidents
 - AA 1683
 - MD-80
- Small transport category incidents
 - Learjet 55
 - Swearingen SA 226
 - Canadair 600

TWA 800 Accident

- July 17, 1996, a Boeing 747-131, broke up in flight and crashed in Atlantic near New York
- Ignition energy for center wing tank explosion most likely entered through fuel quantity indication system (FQIS) wiring
- Neither energy release mechanism or location of ignition determined

Wiring Lessons Learned

- Wiring to pumps located in metallic conduits
 - Wear of teflon sleeving and wiring insulation has allowed arcing inside conduits, causing a potential ignition source in fuel tank
- Fuel pump connectors
 - Arcing at connections within electrical connectors occurred due to bent pins or corrosion

Wiring Lessons Learned

- Wiring often does not meet OEM installation standards
 - Clearance to structure, clamping, routing, bend radius, etc.
- Lack of maintenance detail with respect to wiring
 - Inspection intervals
 - cleaning

Swissair 111 Accident

- Crashed off coast of Nova Scotia on September 2, 1998
- Smoke in cockpit
- Fire in cockpit overhead area
- Metalized mylar insulation blankets
- 23 wires found with arcing damage

Swissair 111 - FAA Plan of Action

- AVR-1 Directive (November 1998)
 - Minimize potential fuel sources
 - Replace metalized mylar insulation blankets
 - Minimize potential ignition sources
 - Focus on wiring

American Airlines 1683 Fire

Background

- On November 29, 2000, American Airlines flight 1683, DC-9-82 aircraft departed from Reagan National Airport, Washington DC to Dallas Fort Worth, Texas at approximately 5:45 PM local time.
- The flight crew reported smoke in the cockpit and cabin shortly after takeoff.
- Aircraft diverted and made an emergency landing safely at Washington Dulles International Airport, Washington at approximately 6:09 PM

American Airlines 1683 Fire

Background

- The DC-9-82 aircraft carried 61 passengers and 5 crew members.
- The passengers were evacuated via both forward cabin slides and no injuries were reported.
- The investigation indicates that the lightning struck the aircraft at about 16,000 ft altitude in the vicinity of an unused Omega antenna in the vertical structure. The antenna's coaxial cable was still connected to the antenna. The other end of the cable was stowed, but not capped, at the cabin ceiling area, above seat rows 7 through 9 (the first three row of coach class). A fire was reported in this area.



**WIRES WERE NOT
CAPPED
AND STOWED**

**AAL#7 N3507A
DC-9-82 11/30/00**



**During flight the crew had
to cut into this ceiling area
to put fire out.**

**BAGGAGE BINS
ABOVE ROW 6 & 7**

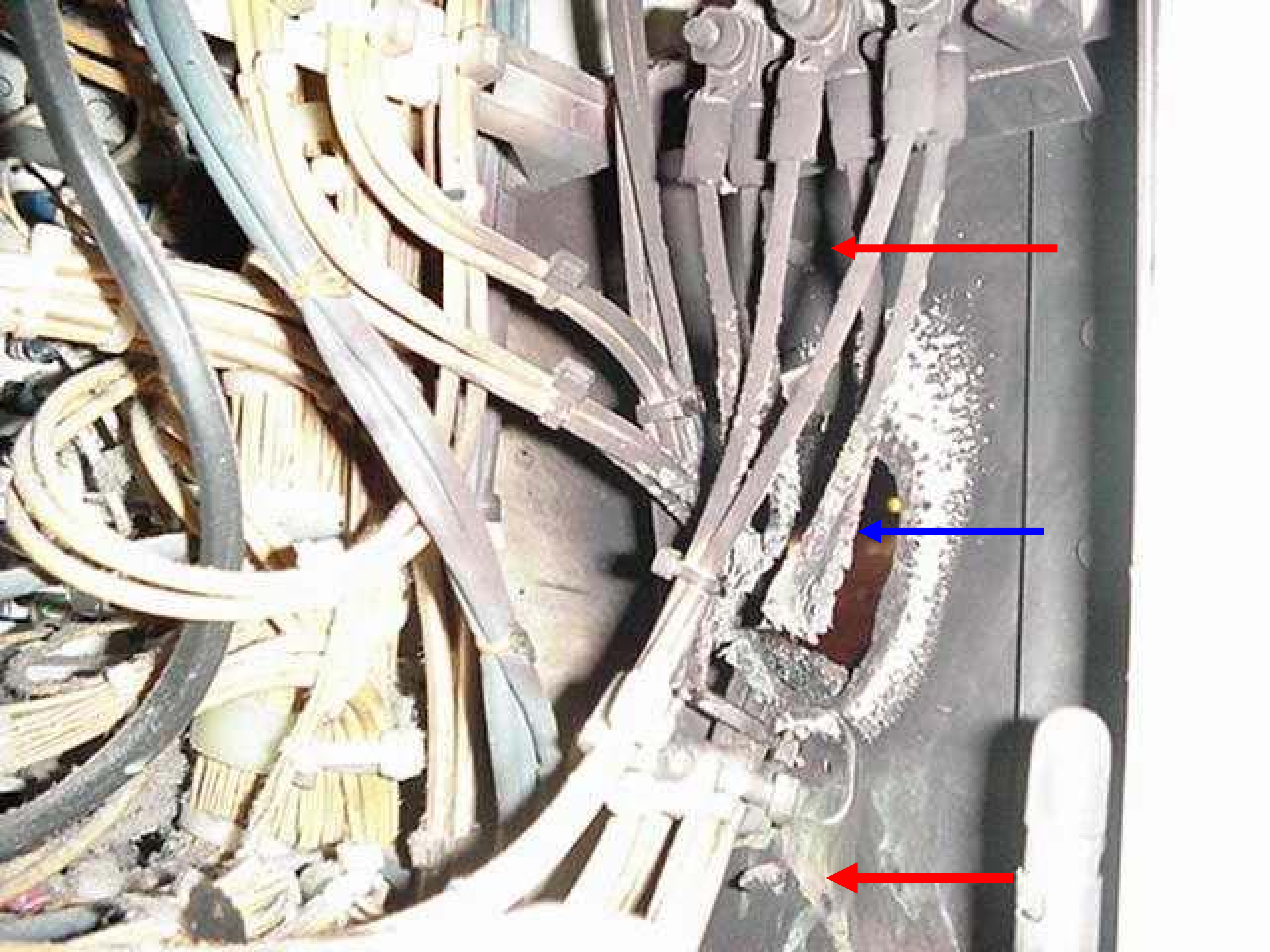
**AAL N3507A
DC9-82 11/30/00**

MD-80 Arcing Incident

- Arcing originated in Electrical Power Center
- Burned through to the cockpit and burned inspector riding in the jumpseat
- Caused by a screw that penetrated into wire bundle in Electrical Power Center



The arcing event, which originated from inside the electrical power center, burned a hole through the left side of the hallway (looking forward) between the cockpit and cabin.



Learjet 55 Fire

- April 17, 1989, McCarren INTL
- Air Turnback
- Onboard Fire and Smoke
- Chafing Galley Door Light Wiring

Swearingen SA-226

- Air Taxi/Commuter
- Fire Warning
- Emergency Landing
- Found Faulty Wiring Connection

Canadair 600

- Refueling panel power wiring installed in reverse
- 28VDC applied to refueling panel chassis
- Possible fuel tank ignition due to arcing/sparking at refueling point
- Emergency Airworthiness Directive (AD) issued

Similarity Between Large and Small Transport Category Wiring

Wiring Technology Differences

- Same basic types of wiring system components
 - Both must meet CFR 25.869
- Similar installation methods

Real Estate Issues

- Smaller airframe
 - Separation generally more difficult to achieve
 - Although similar architectural complexities, less wire lengths

ATSRAC WG10

Findings

- Similar problems -but occur over a longer period of time
 - Problems with inadequate clearance to structure and improper clamp condition, sizing, and spacing.
 - Less debris accumulation on wire bundles, dust and lint observed, but still a problem

Service History

- Wiring related incidents common to both large transport category aircraft and small transport category aircraft.
- The factors influencing wire degradation are the same for both aircraft types.
- Proper installation and maintenance practices are key drivers.