



**Accident Investigation Board of Finland
Annual Report 2004**



MISSION OF ACCIDENT INVESTIGATION BOARD

The Accident Investigation Board of Finland was founded in 1996 within the Ministry of Justice. The tasks of the Accident Investigation Board are specified in the relevant act and decree which also include overall directions on the characteristics of the accidents to be investigated and the methods of investigation to be implemented.

By its investigation activities, the Accident Investigation Board intends to enhance overall safety and prevent accidents. As a result of an accident investigation, an investigation report is produced that contains safety recommendations for the competent authorities and other parties concerned. In fact the safety recommendations translate the investigators' views on the means of prevention of similar or corresponding accidents in the future. The Accident Investigation Board moreover monitors the implementation of the recommendations issued. The investigation work conducted by the Board exclusively focuses on an improvement of safety with no stances taken as for questions of culpability, responsibility or liability for damages.

It is the mission of the Investigation Board to investigate all serious accidents, serious incidents and aviation, rail, and marine accidents and incidents. The investigation of aviation accidents is based on the relevant European Council Directive and the Convention on International Civil Aviation, and the investigation of rail accidents is based on the EU Railway Safety Directive (published on April 1st, 2004). As for maritime accidents, their investigation is based on the guidelines of the International Maritime Organization (IMO).

Accident investigation focuses on the course of events of the accident, its causes and consequences as well as on the relevant rescue measures. Particular attention is paid to whether the safety requirements have been adequately fulfilled in the planning, design, manufacture, construction and use of the equipment and structures involved in the accident. It is also investigated whether the supervision and inspection has been carried out in an appropriate manner. Any eventually detected shortcomings in safety rules and regulations may call for investigation, as well. In addition to the direct causes of an accident, the accident investigation intends to reveal any contributory factors and background circumstances that may be found in the organization, the directions, the code of practice or the work methods.

In the decision-making on the commencement of an accident investigation, the degree of seriousness of the incident is considered as well as its probability of recurrence. An incident or accident or hazardous situation, with only minor consequences may also require investigation in case it sets several persons at risk and an investigation is assessed as producing important information in view of the improvement of the general safety and the prevention of further accidents. Generally speaking, the Accident Investigation Board does not investigate an incident or accident caused intentionally or by an offence.

The Accident Investigation Board is also responsible for, e.g. the maintenance of a contingency to rapidly commence an investigation, the training of new accident investigators, the producing of general instructions on the carrying out of the investigation work and on the drawing up of the investigation reports, and the participation in international cooperation in the field.

Finally the Accident Investigation Board is responsible for the printing and distribution of the investigation reports and their publishing on its web pages, www.onnettomuustutkinta.fi.

Terms

Investigation categories	
A-investigation	Serious accident
B-investigation	Accident or serious incident
C-investigation	Incident, damage or minor accident
D-investigation	Other incident
S-investigation	Safety study

Accident/incident categories	
L	Aviation accidents and incidents
R	Rail accidents and incidents
M	Marine accidents and incidents
Y	Other accidents and incidents

Investigation identifier

Each investigation is designated by an identifier that consists of four parts, such as A 1/2004 R.

The first part refers to the investigation category (A, B, C, D or S).

The second part is a sequence number referring to the order of the accident within its accident category in the year in question.

The third part refers to the year of the accident.

The fourth part indicates the accident category (L, R, M or Y).

E.g. A 1/2004 R refers to the first serious rail accident investigation in 2004.



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REVIEW 2004

In 2004 four of the altogether five investigations of serious incidents that had been commenced in 2004, were completed. The completed investigations included the collapse of the roof of a multi-purpose hall in Mustasaari, the collapse of the roof of the Fair Center in Jyväskylä, the collapse of the intermediate floor structure in a service-station site in Orivesi, and the collapse of the dropped ceiling of an indoor spa resort in Kuopio. Also the investigation conducted on the collapse of the roof of the maintenance building of the Slalom Centre in Pohja municipality, occurring on February 1st, 2004, was completed. The results obtained by the building incident investigations and the corresponding safety recommendations have since been elaborated and discussed in numerous seminars and training sessions.

In 2004 a safety study conducted on all fatal fires in 2003 was completed, as well. In this investigation specifically six serious fires in residential buildings are studied in detail, and all fatal fires in 2003, with a total of 105 victims, are examined and discussed in general terms. The investigation attracted great attention in the media.

On March 19, 2004, the most serious road traffic accident in Finland took place at Konginkangas where the trailer of a truck crashed into a bus on a slippery road. The Council of State appointed a commission to investigate this catastrophe. In addition, an accident involving a bus that had driven off the road at Halikko on December 22, 2004, was taken under investigation.

At the beginning of 2005, the Council of State appointed a commission to investigate the tsunami catastrophe in South-East Asia that had taken place on December 26, 2004, and the measures consequently implemented in Finland. The commission works within the Accident Investigation Board and follows the code of practice of the Board.

In 2004 the Accident Investigation Board commenced altogether 42 accident investigations, that is, two more than in 2003. In addition, a total of 17 so-called preliminary studies, i.e. D-investigations, were conducted, on which standard format reports of a few pages were drawn up. Actually the preliminary study seems to be an efficient and practical method of recording the events of even a minor incident, for possible use at a later phase. On the basis of the preliminary study, the decision is made as to a possible engagement of a more extensive investigation.

In all, 55 accident investigations were completed in 2004, that is, three investigations less than in 2003. The number of completed aviation accident investigations in 2004 decreased by four as compared with 2003; however, a total of fourteen preliminary studies were carried out in 2004 as this form of investigation was adopted for aviation accidents. The performance in the sector of marine accident investigations was quite satisfactory with altogether 27 completed investigations. Towards the end of 2004, 19 marine accidents remained yet to be investigated. In addition, the "Marine distress and safety radio communications" report was finalized in 2004; the report analyses shortcomings observed in the radio communications during the 22 marine accidents that had earlier been investigated. Such safety studies enable a screening of direct causes and background causes detected in several accidents, and hence they provide a solid ground for the

drawing up of safety recommendations. In 2004 a safety study on crew fatigue on the navigation bridge, was commenced.

In 2004 the monitoring of the implementation of the safety recommendations that had been addressed to the competent authorities and other interested parties on the basis of the accident investigations, proceeded significantly, as the monitoring of the aviation recommendations was updated from 2000 onwards and the same monitoring method was adopted for the category "other accidents/ incidents". As for rail services, the updating of the monitoring of the implementation of the recommendations had already been realized long ago. Both in rail traffic and in aviation, about 60 percent of the given recommendations had been adopted and implemented.

In 2004 the EU Parliament adopted a directive on rail traffic safety that also discusses the investigation of rail accidents. The directive specifies the principles of an independent and impartial accident investigation, following the lines of the investigation principles defined for aviation accidents in the directive of 1994. The Railway Safety Directive entering into force in 2006 entails no major changes in the present rail accident investigation practice in Finland.

In a Nordic rail accident investigators' meeting held in Oslo, e.g. the impact of the Directive on the national legislations was discussed. The meeting was attended by investigators from other European countries, as well, and as a result, a decision was made to establish a European Rail Accident Investigators Forum. In 2004 it was the turn of Finland to organize the Nordic meeting of aviation accident investigators; the meeting was held in September at Luosto.

The Accident Investigation Board was offered an opportunity to test its new action plan designed for serious accident and catastrophe situations when in January, Finnair Oyj and Airbus aircraft manufacturer jointly organized an accident investigation rehearsal in Lapland, with the participation of French aviation accident investigators, as well. As a result of this rehearsal, representatives of the Accident Investigation Board of Finland visited France in April 2004.

A one-day training session was arranged separately for the accident investigators of each of the three modes of transport. During the day, current issues, such as the monitoring of the investigation costs, were discussed. Furthermore, the air traffic control experts of the Accident Investigation Board participated in a course on the new European air traffic control system. Finally the Operating Manual and the Investigator guidelines were revised accordingly, on the basis of gained experience. Towards the end of the year, the new Manuals were distributed to the investigators.

To a great extent, the work of the Accident Investigation Board is based on the use of external experts in the investigation commissions. For example, the Accident Investigation Board has no permanently employed investigator who would be expert in the investigation of accidents of the "other accidents/ incidents" category. Over the past years, numerous such accidents have been investigated, and as a result, the number of outside experts in the investigation commissions totalled 88 in 2003 and 70 in 2004.

I want to thank all persons having participated in the accident investigation action, for a well done and very important work that serves the promotion of public safety.

A handwritten signature in black ink, reading "Tuomo Karppinen". The signature is written in a cursive, flowing style.

Tuomo Karppinen
Director

Summary of investigations commenced in 2004

Commenced						
	A	B	C	D	S	TOTAL
Aviation	0	4	8	15	0	27
Rail	0	0	10	0	0	10
Marine	0	8	8	4	1	21
Other	2	2	0	0	0	4
TOTAL	2	14	26	19	1	62

Summary of investigations completed in 2004

Completed						
	A	B	C	D	S	TOTAL
Aviation	0	2	6	14	0	22
Rail	0	0	10	0	0	10
Marine	0	1	26	4	1	32
Other	0	5	0	0	1	6
TOTAL	0	8	42	18	2	70

Investigation commissions

The Accident Investigation Commissions had the following memberships in 2004.

Aviation

Pekka Alaraudanjoki, Jussi Haila, Juhani Hipeli, Ari Huhtala, Ville Hämäläinen, Pekka Kanninen, Erkki Kantola, Veli-Matti Ketola, Matti Korjula, Jouko Koskimies, Tarmo Kulmala, Esko Lähteenmäki, Hannu Melaranta, Juhani Mäkelä, Hannu Mäkeläinen, Sippo Nevalainen, Timo Poikonen, Hans Tefke, Timo Rantala and Timo Wahe.

Rail

Aki Grönblom, Jari Hämäläinen, Jukka Koponen, Reijo Mynttinen, Hannu Räisänen, Esko Värhtiö and Kari Ylönen.

Marine

Veikko Haapanen, Taru Hannikainen, Markku Haranne, Martti Heikkilä, Olavi Huuska, Sakari Häyrynen, Mikko Kallas, Seppo Kalske, Tuomo Karppinen, Jussi Keveri, Kari Larjo, Kari Lehtola, Jaakko Lehtosalo, Karl Loveson, Petri Luotio, Guy Mickelsson, Ari Nieminen, Klaus Rahka, Seppo Rajamäki, Risto Repo, Klaus Salkola, Tapani Salmenhaara, Pertti Siivonen, Juha Sjölund, Matti Sorsa, Risto Tikkanen, Pirjo Valkama-Joutsen, Kai Valonen and Micael Vuorio.

Other

Pekka Aho, Hannu Alén, Maaret Castrén, Markku Haikonen, Risto Hellgren, Jari Hämäläinen, Ville Hämäläinen, Tuomo Karppinen, Markku Korttesmaa, Pentti Kurttila, Risto Lautkaski, Tapio Leino, Timo Lindqvist, Jorma Lähetkangas, Esko Lähteenmäki, Seppo Männikkö, Matti Olsson, Anssi Parviainen, Unto Pentinmäki, Klaus Rahka, Kirsi Rajaniemi, Harri Saajos, Veikko Stolt, Seppo Suuriniemi, Esa Vainio, Ari Vakkilainen, Kai Valonen, Esa Virtanen and Esko Värhtiö.



PERFORMANCE

In the following, the activities of the Accident Investigation Board in 2004 are discussed in terms of the result targets set by the Ministry of Justice.

Elaboration of guidelines in the Investigation Manual to serve as code of practice.

A one-day training session was arranged separately for the investigators of aviation accidents, marine accidents, and rail accidents. In the sessions, e.g. cost monitoring and international rules and regulations were discussed. On the basis of feedback received on the Operating Manual and Investigator Guidelines, new updated guidelines were published.

Implementation of measures specified in the contingency plan for serious accidents.

In view of serious accidents and catastrophes, internal guidelines were drawn up for the Accident Investigation Board, with a specification of the tasks of each person. Plans were also drawn up considering the possible use of external experts in serious accidents and catastrophes. Moreover, the Accident Investigation Board participated in some serious accident rehearsals, e.g. an international rehearsal in Lapland, in connection with which the corresponding action plan was implemented and consequently modified and polished. The investigation plan for a serious aviation accident was implemented in the Konginkangas accident investigation. A cooperation agreement on accident investigation was signed with the Finnish Navy.

Updating and routinizing of an overall monitoring of the recommendations.

As for rail traffic, two routine meetings monitoring the implementation of the recommendations were held in 2004. In the meetings, all safety recommendations failing to have been implemented were discussed as well as the recommendations addressed to rescue authorities. In the aviation sector, the monitoring of the implementation of the recommendations was updated in terms of all safety recommendations issued since 2000, and as a by-product, a relevant monitoring practice was designed and elaborated. This monitoring practice was actually also adopted for the category "other accidents/ incidents". As for marine accidents, the monitoring of the implementation of the recommendations is in progress, but it has not yet been developed to a routine.

The investigation of a serious incident or an accident is carried out within a year, while the investigation of an incident or a minor accident is performed within six months.

Two roof collapse investigations out of a total of five were completed in less than a year, while three investigations lasted for more than a year. The safety study on fatal fires required 14 months of work. The average investigation time needed for aviation accidents was about 7 months (ranging from 2 to 9 months) and for rail accidents, 10 months (ranging from 5 to 15 months).

As for marine accidents, if we exclude the several years lasting accident investigations, the average time of investigation is two years.

Publication of Annual Report.

The Annual Report was published in spring 2004. The format developed for the Annual Report is designed to be used in the future, as well.

Particular attention to be paid to possible open competition and cost monitoring.

Cost monitoring was specially focused. A work team drew up directions for cost and benefit monitoring of the investigations; the directions were appended to the Operating Manual and they were discussed at the investigator training sessions. All chief investigators were regularly advised of the investigation costs, and the cost data were monitored at the Accident Investigation Board meetings, as well. Over the year under review, a few such services and investigations were ordered that could possibly be opened to free competition. In this context, the services that are provided by some universities and that could possibly be used for accident investigation, were studied in detail. At the beginning of November, a visit was made to Oulu University where the activities and services of its Technical Faculty were presented and discussed.

Preparations for adoption of new payroll system.

At the Accident Investigation Board, preparations were made for the introduction of a new payroll system. The question was discussed by the Investigation Board in numerous of its meetings. The job descriptions were submitted to the Ministry of Justice.



AVIATION

In 2004 altogether 12 accident investigations were commenced. One was a fatal general aviation accident with two fatalities. In addition, general aviation was hit by an accident that caused serious disabilities to the pilot. Furthermore in general aviation, there were two helicopter accidents with no personal injuries. In addition, two ultralight aircraft accidents took place with one fatality in each accident and in one of which one person became seriously disabled. No glider accidents were recorded. Moreover, the investigation of taxiing incident of an airliner was commenced, as well as one loss of separation in an air traffic control, and a serious electrical power supply failure in an airliner. Also the investigation of three incidents involving military aircraft was initiated.

In 2004 four persons died in aviation accidents, just as in 2003. An equally high rate of fatalities was recorded in 1993.

In addition to the before mentioned cases, 7 general aviation incidents, 10 glider incidents and 10 ultralight aircraft incidents displaying material damage were recorded. Furthermore, forced landings were made by two general aviation and by five ultralight aircraft. The forced landings resulted in no personal injury.

In 2004 a total of 8 investigations were completed.

In 2004 a preliminary study procedure was adopted, that is, an investigation category D. On the basis of the preliminary study, a decision is made as to whether the incident calls for a C-investigation or whether the preliminary study documents should be recorded as a D-investigation. Over the year under review, 15 D-investigations were commenced and 14 of them completed.

Towards the end of 2003, the Aircraft Accident Investigator's post became vacant and in January, Hannu Melaranta was appointed to the office. Over 2004 he participated in several accident investigation courses, seminars and sessions in Finland and abroad.

In January accident investigators participated in an accident investigation rehearsal organized jointly by Finnair Oyj and the Airbus aircraft manufacturer, in Inari, Lapland.

In April the air traffic control experts of the Accident Investigation Board participated in a seminar presenting the operation of the Eurocat air traffic control system; the seminar was organized in the Air Navigation Services Centre for South Finland.

The Nordic meeting of aviation accident investigators was held in September in Luosto.

The Operating Manual and the Aviation Investigator Guidelines were revised and modified as based on gained operation experience. The adoption and implementation of the Manuals have

proceeded as planned, and they have already greatly contributed to the investigation work and to the training of investigators.

The investigators lectured in various training programmes of different authorities and in other events pertaining to aviation safety.

Investigations commenced in 2004

In 2004 the Accident Investigation Board commenced altogether 12 aviation accident and incident investigations.

Identifier	Date	Title of the investigation
B 1/2004 L	16.2.2004	Ultra-light aircraft accident in Hollola (OH-U415, Dynamic WT9)
B 2/2004 L	16.6.2004	Aircraft accident in Pieksämäki (OH-CFG, Cessna A188)
B 3/2004 L	24.8.2004	Ultra-light aircraft accident in Mäntsälä (OH-U373, Colibri)
B 4/2004 L	19.9.2004	Aircraft accident in Äkäslompolo, Kolari (OH-AKF, Lake LA-4-200)
C 1/2004 L	14.1.2004	Aircraft incident between a training fighter taking off and a taxiing over the runway at Rovaniemi airport (HN-411, F-18C Hornet and HW-399, Hawk MK 51A)
C 2/2004 L	27.4.2003	Serious power supply failure in flight (OH-FAE, Saab 340 A)
C 3/2004 L	23.2.2004	Near collision with net barrier at Kauhava airport (FAF, Vinka)
C 4/2004 L	18.8.2004	Taxiing incident at Helsinki-Vantaa airport (OH-KRL, ATR-72)
C 5/2004 L	30.8.2004	Loss of separation at Helsinki-Vantaa airport (OH-SAN, Avro 146 RJ and OH-KRH, ATR-72)
C 6/2004 L	5.10.2004	Helicopter accident in Inari at Pirunpäävaara (OH-HAV, Schweizer 269C)
C 7/2004 L	16.10.2004	Helicopter accident in Salla, Naruska (OH-HTE, R 22)
C 8/2004 L	19.11.2004	Four helicopters flying within a danger area in Sodankylä (HH-9, HH-10, HH-11 and HH-12, MD 500)

Investigations completed in 2004

In 2004 the Accident Investigation Board completed altogether 8 aviation accident and hazardous situation investigations.

Identifier	Date	Title of the investigation
B 1/2004 L	16.2.2004	Ultra-light aircraft accident in Hollola (OH-U415, Dynamic WT9)
B 3/2004 L	24.8.2004	Ultra-light aircraft accident in Mäntsälä (OH-U373, Colibri)
C 2/2003 L	29.1.2003	Incident between an airliner and airport maintenance vehicle at Kuusamo airport (F-GFUI, Boeing 737-300) <i>(The report is available in English)</i>
C 7/2003 L	11.6.2003	Ultra-light aircraft accident in Kirkkonummi (OH-U387, Ikarus C42)

C 8/2003 L	21.7.2003	Loss of separation Northeast of Helsinki-Vantaa airport (OH-LVD, Airbus 319 and OH-LPH, MD-83)
C 9/2003 L	3.10.2003	Airliner landing with low fuel at Helsinki-Vantaa airport (OY-KBN, Airbus 330-300)
C 10/2003 L	6.12.2003	Taxiing incident at Helsinki-Vantaa airport (OH-LVH, Airbus A319)
C 1/2004 L	14.1.2004	Aircraft incident between a training fighter taking off and a taxiing over the runway at Rovaniemi airport (HN-411, F-18C Hornet and HW-399, Hawk MK 51A)



B 1/2004 L

Ultra-light aircraft accident in Hollola on 16 February, 2004

On February 16th 2004 at 15.18 local time (LT), an ultralight aircraft Dynamic WT-9 crashed during a cross-country flight in Hollola, near Lahti. The pilot of the aircraft fell through the canopy as the aircraft was inverted, and was killed. The passenger remained on his seat as the aircraft continued its dive another 800 meters before it impacted to the ground. The passenger was seriously injured. On February 17th 2004, the Accident Investigation Board Finland, in the decision B 1/2004 L, decided to conduct an investigation into the accident. Investigator Tapani Vääntinen was nominated as the Chairman of the Investigation Commission and Aircraft Accident Investigator Hannu Melaranta as a member of the Commission.

The aircraft had departed from Hyvinkää airport to Vesivehmaa airport earlier that afternoon. After a short stop in Vesivehmaa, the aircraft was supposed to return to Hyvinkää. Departure from Vesivehmaa took place at 15.10 LT. The aircraft headed south, and at the distance of 8 KM, it entered into uncontrolled steep pitch-up attitude, turned inverted, and continued in an inverted dive until the point of impact.

The pilot had relatively short experience and his type training to this particular aircraft type was insufficient. The aircraft possessed longitudinal controllability problems that were noticed during the check-flight programme, which was conducted when the aircraft was imported into the country. Different versions of the flight manual and the weight and balance certificate presented contradictory values for the center of gravity limits of the aircraft. The weight of the aircraft and its center of gravity were out of limits during the time of the accident. No technical fault contributing the accident was found during the investigation.

The probable cause of the accident was overweight and center of gravity that was well beyond the aft limit. As a result, the aircraft became unstable. When the horizontal stabilizer was suddenly pulled back, either by a gust or by the pilot unintentionally, the aircraft entered rapidly in a steep nose-up attitude and further inverted. The pilot had not fastened his seatbelts, or had unfastened them at some point, so he fell through the canopy. One reason for the pilot's unfastened seatbelts could be that they were deliberately unfastened in order to reach for the luggage compartment behind the seats. As a result of this kind of movement, the center of gravity would move even further backwards, making the aircraft more unstable. The horizontal movement of the aircraft had been so rapid, that the pilot had no chance to make corrective action. It is also possible, that as the airspeed decreased, the possible corrective action had no longer effect on the movement of the aircraft.

The Investigation Commission made three safety recommendations as a result of the investigation. The Finnish Aeronautical Association is recommended to emphasize the importance of the student's ability to fully understand the contents of their training and that the training is complemented with practical examples and learning is confirmed by examinations. This should be achieved by stressing the matter during teacher's basic and supplementary training. The Finnish Flight Safety Authority (FSA) is recommended to draw their attention to the performance and handling qualities of various ultra-light aircraft types and to define, if necessary, the requirements set for type training. Further, the FSA is recommended to consider bringing the ultra-light pilot's licence requirements up to date and in line with the current aircraft types' requirements and field of use.

**B 3/2004 L****Aircraft accident in Mäntsälä on 24 August, 2004**

On Tuesday 24. August 2004 an accident occurred near Mäntsälä, where a privately built and owned ultralight singleseat aircraft Colibri MB 2 crashed. The aircraft was destroyed and the pilot was fatally injured. The Accident Investigation Board appointed an investigation commission B 4/2004 L with Jouko Koskimies as investigator-in-charge and Tapani Vänttinen as member.

The pilot arrived at Mäntsälä private airfield in the afternoon to make a practice flight. His intentions were to make some take-off runs at first, due to his difficulties in controlling the aircraft on ground run. The weather was good. The wind was slightly gusty from 270°–300° with speed of 6–10 knots. The maximum side wind component of the aircraft was 11 knots. The pilot made four or five take-off runs on runway 22, and he had obvious difficulties in controlling the aircraft's heading



on runway. Between each run the pilot stopped the aircraft with the engine running and opened the cabin hood to have conversation with the people present. The final take-off was made at 16.25, which after the pilot circled on the east side of the airfield, and finally flew over the field on north-westerly heading towards Mäntsälä. The aircraft crashed at 16.43 about three kilometres south-east from Mäntsälä centre.

The aircraft had crashed on a vertical angle of 40°–50° and banked to the right. The crash trace heading was 044°. The accident site co-ordinates were 60°36,881 N 025°22,121 E (WGS 84). The investigation of the propeller revealed that the engine had been running the whole time. All the outer parts of the aircraft were found, so the aircraft had not broken into pieces in the air. The frame of the cabin hood was apart from the cabin frame, in which the hood lock lever was attached. The lock was open, the hinges were unbroken, but the limiter rope was broken. The spring belonging to the lock lever was missing. The acrylic hood had gone into pieces, but some pieces were still attached to the hood frame. There were lots of pieces of the hood along the crash trail. Some of the pieces were found also approximately 700 meters east-south-east from the accident site. A conclusion was made that the hood had opened in the air and hit the wing. The dispersion of the aircraft and the crash traces on ground proved that the collision speed was high. It was also possible to draw the conclusion that the aircraft had not been in a spin. The aircraft was not overweight. The centre of gravity was within the limits.

The probable cause of the accident is that the lock lever of the hood had during the flight accidentally opened. The side-hinged hood had immediately opened and hit the right wing of the aircraft, and the hood partially broke. On the basis of the finding place of the hood pieces, it is obvious that the hood had accidentally opened just before the crash dive. The aerodynamic drag of the large hood swung the nose of the aircraft to the right. Simultaneously the aircraft rolled rapidly to the right and the nose went into a steep dive. All happened so swiftly that the pilot lost the possibility to upright the aircraft because of low altitude.

The investigation commission presented no safety recommendations.

C 2/2003 L

Incident between an airliner and airport maintenance vehicle at Kuusamo airport on 29 January, 2003

On Wednesday 29 January 2003 at 13.53 Finnish time, an air traffic incident occurred at Kuusamo airport, in which a charter airliner landed over a vehicle used for runway visual range (RVR) measurement at runway threshold. The Accident Investigation Board, Finland, decided to start an investigation of the incident on 31 January 2003. Ari Huhtala was appointed as investigator-in-charge, and Pekka Alaraudanjoki as a member of the investigation group. The French accident investigation authority nominated an accredited representative for the investigation.

After noon on the day of the incident, runway visual range (RVR) at Kuusamo airport decreased below 1500 meters, and the Flight Information Service Officer (FISO) asked an airport maintenance worker to measure RVR. By FISO's permission, airport maintenance vehicle Lento 30 was moved to the RVR measurement point, which was on the runway strip behind RWY 12 threshold. At the same time, a Boeing 737-300 airliner, call sign AXY852, operated by a French company

named Axis Airways on a charter flight from Paris to Kuusamo, commenced an ILS approach to runway 12 without reporting its intentions and actions to FISO. Because of AXY852's position reports were deficient and sometimes missing, and there was some confusion related to radio communications, FISO did not have a clear picture of the flights' progression. AXY852 landed without receiving a "runway free" report from FISO. FISO had no time to request the airport maintenance vehicle to move away from the measurement point. The aircraft passed over the vehicle at runway 12 threshold with a vertical distance of 15-20 meters.

The investigation studied the actions of airport staff and flight crew at different stages of the incident. It was recognized that the flight crew did not comply with the instructions given in the Finnish Aeronautical Information Publication (AIP) on operations at AFIS aerodromes in Finland. Moreover, it was observed that FISO's actions were partly based on assumptions. She did not ask the pilots to repeat those radio transmissions which she did not catch or understand.

The incident occurred because AXY852 did not report entering the flight information zone or notify its intentions as required. It also failed to give all mandatory position reports during approach, and finally landed on the runway occupied by the maintenance vehicle. A contributing factor was that FISO did not fully understand the radio transmissions of AXY852, which were spoken in English with a French accent, but did not ask the pilot to repeat all messages that remained unclear to her. Moreover, the flight crew was not sufficiently aware of how air traffic services are provided at AFIS aerodromes in Finland.

To improve flight safety, the investigation commission recommends that instructions for air traffic services at AFIS aerodromes should be harmonised in all European Union member states.

The comments to the final draft have been taken into account in the final report.



C 7/2003 L

**Ultra-light aircraft accident in Kirkkonummi
on 11 June, 2003**

On June 11, 2003, at 12:17 local time there was an ultralight aircraft accident when an Ikarus C42, registered OH-U387, stalled at a height of 10–15 m and crashed on a field. Investigator Tapani Vänttinen was nominated as the investigator-in-charge and investigator Ville Hämäläinen as a member of the investigation commission.



The pilot tried to take off from the field with one passenger. The ground roll was unusually long and the pilot continued to accelerate in the ground effect after the lift off. Then he banked left and continued climbing. The aircraft stalled during the climbing turn, rolled left and crashed. Both persons were seriously injured.

The investigators found out that the conditions were against a successful take off. The take off direction was uphill and with tailwind, the aircraft was overweight, the field was uneven when compared to the aircraft wheel size, the pilot used full trailing edge flap setting and the engine was likely not producing maximum power due to an earlier impact damage. The cause of the accident was the decision of the pilot to begin the take off from the field under the unfavourable conditions.

The investigators recommended that the Flight Safety Authority would pay attention to the safety belt mounting of the aircraft. The investigators also recommended that the Flight Safety Authority would require all ultralight flight manuals to contain the measured air speed calibration tables.

C 8/2003 L

Loss of separation Northeast of Helsinki-Vantaa airport 21 July, 2003

On Monday, July 7, 2003 at 12:04 UTC (Finnish time –3 h) there was a loss of separation approximately 18 nautical miles Northeast of Helsinki-Vantaa airport, when an Airbus 319, registered OH-LVD, call sign FIN473, operated by Finnair Oyj, on a scheduled passenger flight from Rovaniemi to Helsinki and controlled by the Arrival radar, and a MD-83, registered OH-LPH, call sign FIN934, operated by Finnair Oyj, on a scheduled passenger flight from Manchester to Helsinki and controlled by the Approach radar, passed each other with a vertical separation of 200 feet and horizontal separation of 2.4 nautical miles.

The Accident Investigation Board Finland nominated July 28 a commission to investigate the incident. Investigator Ville Hämäläinen was nominated as the investigator-in-charge and investigators Erkki Kantola and Pekka Kanninen as members of the commission.

FIN473 was approaching from the VOR/DME ORIMAA. APP cleared it heading 185 and descend to FL 100. Next FIN472 received heading 360 and clearance to descend to FL 70. Then it was transferred to ARR frequency. FIN473 approached runway 22L extension from south. FIN934 was approaching from LAKUT reporting point. APP cleared it to follow Lakut3E transition and to descend to FL 90. Next APP gave FIN934 heading 070 and planned to vector it to the runway 22L via right base leg. APP did not think there was any conflicting traffic and cleared FIN934 to descend to 5000 feet on QNH 1018 with a new heading of 040. Thus FIN473 and FIN934 were on crossing flight paths.

The traffic controlled by ARR was in disorder due to a wrong turn direction given to the flight SK1706. After determining a new approach sequence ARR cleared FIN473 to descend to FL 60. The heading of FIN473 took it through localizer towards FIN934. Both APP and ARR controllers were focused to follow SK1706 and neither noticed that FIN934 and FIN473 were approaching each other so that the radar separation of 3 nautical miles would be lost. When ARR gave FIN473 a new heading towards the airport he noticed that both aircraft were at almost the same altitude and the separation was lost. He cleared FIN473 to expedite descent to 5000 feet without knowing

that APP had cleared FIN934 also to 5000 feet. When the aircraft passed each other the vertical separation was 200 feet and horizontal 2.4 nautical miles.

The investigation commission recommended that the Civil Aviation Administration would consider, together with the ATC units and Avia College, to increase the co-operation training during the annual refresher training of the controllers. The commission also recommended that the CAA would study, with the ATC units, the possibility to improve the readability of the radar screens.

C 9/2003 L

Airliner landing with low fuel at Helsinki-Vantaa airport on 3 October, 2003

On Friday 3.10.2003 at 5:56 UTC (Co-ordinated universal time) landed SK946, Airbus 330-300 with Danish registration OY-KBN, operated by Scandinavian Airlines, in Helsinki-Vantaa airport, Finland, with the fuel less than the required final reserve fuel.

The scheduled flight SK946 had departed from Chicago O'Hare airport, USA, bound for Stockholm Arlanda, Sweden. The planned destination alternate airport was Gothenburg, Sweden. The fuel consumption en route was higher than calculated in the Operational Flight Plan (OFP) of the flight. All the contingency fuel of 1300 kg and extra fuel of 200 kg was used before the top of descent. There were low visibility procedures (LVP) in force in Arlanda when SK946 entered the Stockholm terminal control area (TMA). The commander requested a category II (CAT II) approach. The air traffic control cleared SK946 to holding, but the commander of SK946 reported that they do not have time for holding due to the fuel situation and requested radar vectoring for approach. SK946 managed to change the approach sequence with an other aircraft of the same airline. The pilots expected a short vectoring, but the capacity of the Arlanda airport was reduced due to the LVP. SK946 flew during approach in TMA 20 minutes and about 65 track miles instead of 12 minutes and about 40 NM which the pilots had expected. The pilots noticed during approach that they would not, in case of a missed approach, have enough fuel to fly to the planned alternate airport Gothenburg. They decided to take Helsinki-Vantaa, Finland, as a new alternate because of 400 kg less fuel consumption. The runway visual range varied in Arlanda between 400 and 450 m during the CAT II approach, which was stable, but the pilots did not obtain visual contact to the approach or runway lights at the decision height. The commander initiated a missed approach procedure and the first officer requested a route clearance to Helsinki-Vantaa. SK946 contacted the Tampere area control centre on cruising flight level 270 and reported that the flight would have less fuel than required upon landing in Helsinki-Vantaa. The ATC issued a direct routing and an approach clearance without restrictions to runway 15. The rescue services were alarmed at the airport. SK946 landed uneventfully in Helsinki-Vantaa at 5:56 o'clock with fuel of 1800 kg.

SK946 used on flight from the destination airport Arlanda to the alternate airport Helsinki-Vantaa fuel 600 kg more than calculated in the OFP. The pilots did not pay in flight planning attention to possible traffic delay in the destination airport Arlanda. The commander did not take enough fuel for a long approach caused by the low visibility procedures which involved reduced capacity of the airport. The fuel consumption during cruise was higher than calculated and all of the contingency and extra fuel was used en route. The fuel checks and total used fuel was not entered in the OFPs of the airline appropriately.

The investigation commission made three safety recommendations to Scandinavian Airlines. The commission recommended the airline to check the alternate fuel calculation basis used in the operational flight plans. The airline was recommended to draw the attention of their flight crews to the approach fuel calculated by the RODOS Planning system. The commanders should be recommended to take extra fuel for a possible approach delay caused by the weather conditions and/or intense traffic. The airline recommended to order the flight crews to make the fuel checks also on the last part of the flights, enter the checks in the OFPs and check and mark the remaining block fuel or the total fuel consumed of every flight appropriately.



C 10/2003 L

**Taxiing incident at Helsinki-Vantaa airport
on 6 December, 2003**

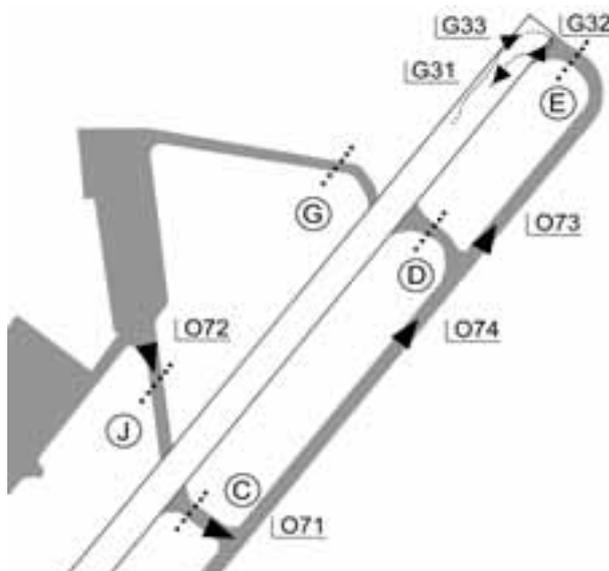
On Wednesday 6 December 2003, an Airbus A319 airliner owned and operated by Finnair Ltd., registered OH-LVH, collided its left engine with passenger bridge 24 while taxiing to the docking station at Helsinki-Vantaa airport, Finland. The Finnish Accident Investigation Board (AIB) decided to investigate the case (decision no. C 10/2003 L). Heikki Tenhovuori was appointed as investigator-in-charge, and Arto Nissinen and Toivo Vitikka as members of the investigation commission.

The incident aircraft was arriving from Munich on scheduled flight AY804 and started taxiing towards the docking station, guided with the APIS system. At the same time, the gate officer on duty started to drive the passenger bridge, using automatic control, from its assumed basic position towards the bridge's holding position for that particular aircraft type. However, the passenger bridge was actually not in its correct basic position, and it moved considerably beyond the programmed holding position towards the arriving aircraft. As a result, the aircraft's left engine collided with the passenger bridge when the APIS display still showed two indicator bars, which corresponds to a remaining taxiing distance of about 1.2 metres.

The investigation revealed that the program logic of the passenger bridge automatic control was not sufficiently able to identify and indicate an error in longitudinal control. For this reason, the bridge was driven into its maximum position, which is about 4.2 metres further than it was supposed to be, according to the selected program.

The passenger bridge had extended to its maximum length, beyond the correct holding position, because of a malfunction in the automatic control system. Contributing factors to the incident were: 1) Double standards had developed in the passenger bridge operation, as well as for handling any faults and malfunctions with the passenger bridges. One procedure was in accordance with official training, and another was an established practice in daily operations. 2) There were shortcomings in the bridge operators' training, operating instructions, and in the monitoring of faults and malfunctions. 3) The marshallers, who carried out malfunction analyses and made decisions about taking a passenger bridge back into service after a malfunction, had insufficient training for handling these malfunctions and identifying any safety risks. 4) The responsible organisations had not audited the operating procedures, instructions and practices for bridge 24. 5) The persons in charge had differing views about the technical characteristics and driving practices of bridge 24.

The investigation commission gave the following safety recommendations: 1) CAA Finland should develop an indicator system for monitoring the position of passenger bridges, based on the APIS system. 2) CAA Finland should examine any prospects for improving technical reliability of the passenger bridge drive system, so that position detection would remain under control despite any fault or malfunction. 3) Helsinki-Vantaa airport should update the operating instructions for bridge 24 and make them constantly available to personnel. Moreover, bridge operators should be provided with a checklist for quick revision of the driving procedures, including safety instructions for the gate in question. 4) Helsinki-Vantaa airport should develop a procedure for collecting any technical failures and operational problems of passenger bridges into a follow-up file, and analysing them at regular intervals. Bridge operations should also be included in internal auditing. 5) Helsinki-Vantaa airport should provide sufficient training for technical support personnel on managing any malfunctions of passenger bridges. 6) Finnair Ltd. should ensure that gate officials are assigned to bridge 24 driving duty in good time.



C 1/2004 L

Aircraft incident between a training fighter taking off and a taxiing over the runway at Rovaniemi airport on 14 January, 2004

On Wednesday January 14, 2004, at 14:41 Finnish time there was an aircraft incident at Rovaniemi airport between a training fighter Hawk MK 51A taking off and a fighter F-18C Hornet taxiing over the runway.

It was slowly snowing at Rovaniemi airport at the time of incident. The sun had set at 14.26 o'clock and there was low cloud. It was dusk and instrument meteorological conditions prevailed. Military aircraft used the whole runway length for take off because the runway was slippery. The tower controller had cleared a Hawk formation G31 (three aircraft) to taxi from holding position Golf via runway 03 to line up runway 21. At the same time O71 (two F-18) were cleared to taxi to holding position Juliet and over runway 21 to holding position Echo. The controller assumed G31 would be ready for take off when the first F-18 had crossed the runway and he ordered the second F-18 to hold at Juliet. After this G31 was cleared for take off. They took off one by one. The controller followed that O72 stops at the holding position Juliet. At the same time he gave route clearances to the aircraft departing next and control zone traffic information to the radar controller. The controller did not count the number of Hawks taking off but instead followed them "from the corner of his eye". He looked at the runway to see if all the Hawks had taken off. The runway seemed to be empty and accordingly the controller gave O72 clearance to taxi across the runway. When O72 was taxiing across the runway, the third Hawk G33 was starting its take off roll. The pilot of G33 noticed the F-18 taxiing in front of him and aborted the take off. The controller simultaneously noticed the situation and ordered G33 to stop. Also the pilot of O72 noticed the approaching Hawk and accelerated taxiing to hurry over the runway. The filament of the taxi/approach light of last Hawk, G33, had been burned which impaired its visibility under the prevailing conditions.

The investigators found out that the controller knew there were three aircraft in the formation G31 taking off one by one at approximately 20 seconds intervals. As the formation took off the controller did not count the number of aircraft taking off and did not sufficiently secure that the runway was free before giving O72 clearance to taxi across the runway. The last Hawk G33 of the formation had problems to steer to the take off heading due to the slippery runway, and thus its take off

roll began approximately 25 later than normally. The pilot did not report to tower his delay for take off. Also, it did not have an operating taxi/approach light and it was thus nearly impossible to obtain visual contact to it from the control tower under the prevailing conditions.

The cause of the incident was the controller giving O72 the clearance to taxi across the runway without securing that all Hawks had already taken off. Contributing factors were, that the visual limitation to see with eyesight only a dark aircraft against a dark background, especially without an operating taxi/approach light and that the pilot did not inform tower that he will be late for take off.

The comments received to the final draft of the investigation report have been taken into account in the final version.

Recommendations

The aviation accident investigations that were completed in 2004 yielded a total of 18 recommendations. As stated in the Operating Manuals, the Accident Investigation Board monitors the implementation of the recommendations by means of a specific monitoring program. All recommendations issued since 2000 are included in the monitoring program. The recommendations published in the investigation reports completed in 2004 were addressed to the following authorities and parties.

Civil aviation administration	5
Flight safety authority	4
Finnish aeronautical association	1
Airports	3
State institutions	-
Airline companies / aviation schools	5
Pilots	-
Aircraft manufacturers	-
General recommendations	-
Investigations without recommendations	3

Of the recommendations issued in 2000-2003, 54.7% have been implemented while the realization of 21.6% yet remains unachieved. 10.1% of the recommendations are of a general nature, that is, they are addressed to a large group of for example aircraft operators, pilots etc. Among the recommendations, 13.5% have received a negative response, that is, they will not be implemented.

Aviation investigations in 2000–2004

Accidents investigated	2000	2001	2002	2003	2004	TOT
Serious accidents (A-investigations)	-	-	-	-	-	0
Other accidents (B- ja C-investigations)	23	17	15	12	12	79
TOTAL	23	17	15	12	12	79

Investigations as per type of accident/incident	2000	2001	2002	2003	2004	TOT
Accidents	11	7	4	2	6	30
Damages	2	6	5	3	1	17
Losses of separation	5	4	5	5	1	20
Other	5	-	1	2	4	12

Investigations as per aviation category	2000	2001	2002	2003	2004	TOT
Commercial aviation	9	7	9	8	3	36
Other	14	10	6	4	9	43

Investigations as per aircraft category	2000	2001	2002	2003	2004	TOT
Commercial aircraft	7	8	7	8	3	33
General aviation aircraft, helicopter	7	6	6	3	4	26
Hobby and ultra-light aircrafts	9	3	2	1	2	17
FAF aircraft					3	3

Personal injuries		2000	2001	2002	2003	2004	TOT
Deceased	Pilot	3	2	2	1	3	11
	Passenger	-	-	-	3	1	4
	Total	3	2	2	4	4	15
Seriously injured	Pilot	4	1	2	1	1	9
	Passenger	1	2	-	1	1	5
	Total	5	3	2	2	2	14
Slightly injured	Pilot	-	3	-	1	-	4
	Passenger	-	-	-	1	-	1
	Other	1	-	-	-	-	1
	Total	1	3	0	2	0	6
TOTAL		9	8	4	8	6	35



RAIL

In 2004 the Accident Investigation Board commenced ten rail accident investigations, all of which were C-investigations. The investigations included three freight train derailments, three shunting unit derailments, one shunting unit collision and two hazardous situations. The freight train derailments were caused by defects and shortcomings in the track.

In 2004 ten C-investigations were completed. Among the completed investigations, the three most important ones concerned derailments of freight train cars that were loaded with timber; the derailments were caused by the poor condition of the track. In one incident 12 cars derailed, in the second 9 cars, and in the third incident, one car.

In 2004 ten new recommendations were issued. The annual Board meetings monitoring the implementation of the recommendations were held in October. At the meetings, seven recommendations were confirmed as having been implemented over 2004. At the end of 2004, the total number of issued recommendations was 194, 121 of which (62%) had been implemented by the date of the October meetings.

The rail accident investigators of the Accident Investigation Board participated in a Nordic Railway Investigators Meeting (NRAI), held in October in Oslo. At the meeting, the different accident investigation methods used in the different Nordic countries were discussed, as well as the impact of the above mentioned EU Directive on the national legislations. Moreover, some examples of accident investigations conducted in the different countries were presented and discussed. The meeting welcomed visiting rail accident investigators from Great Britain, Holland, Germany, Ireland and Switzerland. At the meeting, a decision was made on the establishing of a European Rail Accident Investigators Forum with its first meeting to be held in spring 2005 as convened by the representative of Holland.

In May and in December, a one-day investigation seminar was arranged for rail accident investigators (including part-time investigators). The first day focused on the revision and modification of the Investigator Guidelines and the Operating Manual, the importance of scientific and experimental knowledge in an investigating solving of problems, the realization of the investigation by means of example investigation, and the monitoring of the costs of the investigations. The topic of the second day was the recording equipment.

Towards the end of the year, the requisite modifications and changes that had been drawn up in 2002 and updated in 2003, were made in the Operating Manual and the Investigator Guidelines.

Investigations commenced in 2004

In 2004 altogether 10 C-investigations were started. Among the accidents and incidents accepted for investigation, there was one collision, 6 derailments, 1 hazardous situation and 1 irregularity in the train control system.

Identifier	Date	Title of the investigation
C 1/2004 R		Abnormalities caused by updating failures in automatic train controlling system at Kekomäki and Kirkkonummi
C 2/2004 R	15.4.2004	Three methanol carrying tank wagons derailling at Hamina port
C 3/2004 R	8.5.2004	Freight train car derailling at Joensuu
C 4/2004 R	11.5.2004	Freight cars derailling on Pieksämäki railway yard
C 5/2004 R	12.5.2004	Wheelset of a shunting work locomotive derailling on Kokkola railway yard
C 6/2004 R	7.6.2004	Two Russian container wagons loaded with sulphur dioxide carrying containers derailed at Harjavalta
C 7/2004 R	15.6.2004	Hazardous situation caused by escaping of a sleeper carrying wagon (empty) on the Kempele-Liminka section
C 8/2004 R	29.6.2004	Shunting unit and reach truck colliding in Helsinki West Port
C 9/2004 R	15.7.2004	Train crew member injured in shunting work at Hamina port
C 10/2004 R	30.7.2004	Two freight wagons derailling at Kouvola railway yard

Investigations completed in 2004

In 2004 altogether 10 C-investigations were completed. 7 of the investigations had been commenced in 2003 and 3 in 2004.

Identifier	Date	Title of the investigation
C 1/2003 R	3.1.2003	Three tank wagons derailling at Hamina port
C 3/2003 R	30.3.2003	Wheelset of freight train locomotive, derailling at Koskenkorva station
C 5/2003 R	28.5.2003	Last car of freight train displaying bearing damage and derailling in Lahti
C 6/2003 R	1.7.2003	Shunting unit and vehicle combination carrying a cement load colliding in Lappeenranta
C 7/2003 R	16.7.2003	Fourteen Russian freight cars derailling on the section between Hammaslahti and Tikkala
C 9/2003 R	31.7.2003	Nine loaded timber-carrying wagons derailling at Rantasalmi
C 10/2003 R	14.11.2003	Shunting unit colliding with wagons designed for the transport of dangerous goods on Kemi railway yard
C 3/2004 R	8.5.2004	Freight train car derailling at Joensuu
C 6/2004 R	7.6.2004	Two Russian container wagons loaded with sulphur dioxide carrying containers derailed at Harjavalta
C 8/2004 R	29.6.2004	Shunting unit and reach truck colliding in Helsinki West Port



C 1/2003 R

Three tank wagons derailling at Hamina port on 3 January, 2003

On January 3, 2003 at 19.15 hours, three empty Russian tank wagons derailed at Hamina port, Finland, immediately upon leaving their unloading site. The wagons were designed for carrying of heavy fuel oil. The incident caused no damage to the track or the rolling stock.

The derailment took place when the locomotive started to haul the just formed shunting unit off track 441. The rear bogie of the third last wagon of the unit derailed in an extensive frozen ice area, pulling along the two last wagons of the unit, as well.

In fact steaming had been operated on the unloading site, and the resulting condensation water had frozen on the channel rail construction so as to cover the rail channels and hence cause the wagon to derail.

In order to prevent corresponding incidents in the future, the Accident Investigation Board of Finland recommends that no channel rail structures be adopted in tracks on unloading sites where steaming is implemented in the unloading operations.



C 3/2003 R

Wheelset of freight train locomotive, derailling at Koskenkorva station on 30 March, 2003

On Sunday March 30, 2003, at 17.15 hrs, the rear wheelset of the locomotive of a freight train derailed at Koskenkorva station when the train ran into a log of birch wood lying lengthwise between the tracks. As a result of the incident, the Dv12 dieselhydraulic locomotive in question, two wooden decks of level-crossing, and track and safety installations and track equipment over about 170 meters were damaged. No personal injury was generated by the incident. The resulting total costs amounted to about € 7,900.

The direct cause of the incident was the locomotive bumping into the birch-wood log lying between the tracks. As a factor contributing to the generation of the incident, the engine driver failed to brake though he perceived the log well before the bumping into it. He did not even brake when the log hit the locomotive.

In order to prevent corresponding incidents in the future, the Accident Investigation Board of Finland recommends that the person responsible for the checking of the travel condition of the train, pay more attention to an appropriate loading of the train and whenever necessary, tie the load, before giving the train a departure permission.



C 5/2003 R

Last car of freight train displaying bearing damage and derailling in Lahti on 28 May, 2003

On Wednesday May 28, 2003, at 23.42 hrs, the last car of a freight train derailed at Lahti station. The freight train was travelling from Joutseno via Riihimäki toward Tampere. As a result of the incident, the last car of the train, three turnouts, an electric-railway pole with its foundation, and about one kilometer of track were damaged. The overall costs generated by the incident amounted to about € 220,000.

As the freight train was approaching Lahti station, an axle of its last car broke and the car derailed. A remote control operator working at Lahti station heard the sound of a car wheel beating the sleepers, and he perceived a jet of sparks protruding from beneath the car, when the car was arriving at the station. By using his line radio, he told the engine driver to stop the train.

The breaking of the axle was caused by a sticking of the wheel bearings. In fact the brass holder of the outer bearing had probably broken and thereby caused the damaging and sticking of the outer bearing. Thereafter also the inner bearing had stuck. The bearings having stuck, the axle heated and was glowing red and finally it broke. Then the axle box came loose and flew off by the track. As a result, the wheelset derailed.

As all bearings of the type referred will be taken out of service, the Accident Investigation Board of Finland does not give any relevant recommendations.

In terms of hot-box detectors, the Accident Investigation Board notes a favourable development and progress and suggests that their generalization take place at an even faster pace than currently.



C 6/2003 R

Shunting unit and vehicle combination carrying a cement load colliding in Lappeenranta on 1 July, 2003

On Tuesday July 1st, 2003, an accident took place in Lappeenranta, Finland, when a shunting unit collided with a vehicle combination travelling on a level crossing. In the accident four persons were slightly injured. The locomotive of the shunting unit derailed. As a result of the accident, the trailer of the vehicle combination, a Dv12 dieselhydraulic locomotive and safety installations in the track were damaged. Moreover, the rubber deck of the level crossing suffered some damage. The resulting total cost amounted to about € 150 300.

The accident was caused by the vehicle combination having insufficient time at its disposal for passing the level crossing before the arrival of the shunting unit at the crossing. The visual clearance at the level crossing does not always ensure its safe crossing. As a contributory factor to the accident, within the level crossing area the attention of the driver of the vehicle combination was partly focussed on his mobile phone.

With consideration of the accident, the Accident Investigation Board of Finland recommends that the level crossing referred to be equipped with warning devices. The Accident Investigation Board moreover recommends that such level crossings without safety installations, featuring a poor visual clearance that cannot ensure vehicle combinations a safe crossing, be equipped with a driving prohibition sign applicable to regular vehicle combination traffic.



C 7/2003 R

Fourteen Russian freight cars derailling on the section between Hammaslahti and Tikkala on 16 July, 2003

On Wednesday July 16, 2003 at 15.48 hours, a train accident took place on the section between Hammaslahti and Tikkala in Finland: 14 freight cars of a train travelling from Uimaharju toward Niirala derailed. The derailed cars were in the middle of the train, the first one being the 24th car from the locomotive. At the time of the incident the train was running at a speed of 73km/h. No personal injury was generated in the incident, but thirteen Russian timber-carrying cars were damaged as well as ten electric-railway poles and about 400 meters of track. Moreover at the site of the incident, the wooden planking of a level crossing with a farm road was entirely destroyed.

The immediate cause of the incident included the important stress generated in the track as a result of hot weather conditions, and the subsequent heat curve. The relevant incident investigation conducted was unable to specify a particular technical cause for the incapacity of the track structures to endure the generated stress. Actually the relatively advanced age of the track between Hammaslahti and Tikkala and its partly poor condition undoubtedly contributed to the discharging of the stress so as to form a heat curve. The track runs on soft marshland, and its maintenance has therefore proven to be particularly difficult. In this specific case, some railway officials detected the transition that had preceded the heat curve. Unfortunately in spite of the efforts of the engine drivers and the remote control operators, no adequate measures were engaged so as to prevent the incident.

Consequently the Accident Investigation Board of Finland recommends that in view of a prevention of such incidents, the condition of the section between Hammaslahti and Tikkala be improved by implementation of its overall reconstruction or by an adoption and realization of a new track lay-out. In addition, certain improvements in the drawing up of notices of railway technical defects are also recommended to be adopted.



C 9/2003 R

Nine loaded timber-carrying wagons derailed at Rantasalmi on 31 July, 2003

On Thursday July 31, 2003, an incident took place at Rantasalmi where nine wagons of a freight train derailed. In the incident, the nine derailed wagons were damaged as well as about 200 m of track.

The direct cause of the wagon derailment incident was a heat curve having been generated in the track. The heat curve again was a result of the high temperature of the track combined with the poor condition of the rail fastenings and the sleeper bed, as well as the dislocation of rail joints. In addition, the sleeper replacement work in the track and the on-going tamping operations contributed to the vulnerability of the track.

In order to prevent corresponding incidents in the future, the Accident Investigation Board of Finland reiterates its recommendation S181 issued as a result of an accident having taken place at Huutokoski, Finland, on May 31, 2002. The track should immediately be repaired and the defective old sleepers be replaced by new ones. Replacement of spike fastening by screw fastening, replacement of the rails by heavier ones, and replacement of the gravel in the railway bed by ballast should be discussed and considered.



C 10/2003 R

Shunting unit colliding with wagons designed for the transport of dangerous goods on Kemi railway yard on 14 November, 2003

On Friday November 14, 2003 on Kemi railway yard, an incident took place where three empty sodium chlorate wagons and seven loaded cellulose carrying wagons pushed by a shunting locomotive, bumped into loaded sodium chlorate wagons that were at stand-still on the track. As a result of the incident, three wagons derailed. The damage generated by the collision corresponded to about €17,000.

The incident was caused by the shunting foreman having by error mixed up the tracks. In fact he had requested the shunting operator to move the wagons to track 17 while he himself nevertheless was standing between track 14 and track 15, waiting for the wagons to arrive on track 16.

To prevent corresponding incidents in the future, the Accident Investigation Board of Finland recommends that shunting staffs be ensured relevant training whenever changes or modifications have been realized in the railway yard and that the railway yard tracks be equipped with number plates.



C 3/2004 R

Freight train car derailling at Joensuu on 8 May, 2004

On Saturday May 8, 2004 a rail incident took place at Joensuu where one car of a freight train travelling from Ilomantsi to Joensuu derailed and tilted so as to drop a part of its roundwood load to the railway bed. The incident occurred when the freight train travelling from Ilomantsi to Joensuu arrived in the south end of Joensuu yard at a turnout where the Ilomantsi line enters Joensuu

Railway yard. At the turnout, the fourth last car of the train derailed. The train continued running over a distance of about 150 meters and then stopped. No personal injury resulted from the incident. The derailed car broke track equipment and was itself damaged beyond repair. On the railway line, the incident caused a ten hour interruption in the rail services heading southward from Joensuu.

The incident was caused by a heat curve in the track four kilometers before Joensuu that had been generated as a result of a thermal expansion of the rails. Actually the train did not derail at the heat curve but some train buffers bumped "crosswise" and caused the car to proceed somewhat transversely and hence forced the track to spread. The derailling took place in the south end of Joensuu railway yard when the train arrived at a more rigidly supported turnout with a heavier rail which resisted the stress of spreading. When the train arrived at the turnout, the left wheel flange of the front wheelset of the fourth last car of the train raised above the rail and then the right wheel fell inside the track and the car derailed.

In the section of the track where the heat curve had generated, there was sleeper replacement work going on. In fact the track had been temporarily opened for traffic the previous day, with the intention of packing the track by using a tamping machine on Monday. At the date of the incident the outdoor temperature rose to +26°C.

To prevent corresponding incidents in the future, the Accident Investigation Board of Finland recommends that in all work site plans, condition limits be specified for unfinished track work sites that are temporarily opened for traffic. The condition limits would unambiguously define the circumstances where the condition of the track no longer permits its utilization as due to a risk of generation of a heat curve or as due to other changes in the track condition.



C 6/2004 R

Two Russian container wagons loaded with sulphur dioxide carrying containers derailed at Harjavalta on 7 June, 2004

On Monday June 7, 2004 during shunting operations within a plant area at Harjavalta, two container wagons loaded with sulphur dioxide carrying containers derailed. No personal injury was caused by the incident. About 50 meters of track was damaged and the wheelsets had to be replaced in the two wagons.

The derailment took place when a shunting unit was picking up the wagons in the plant area: the locomotive was pushing nine wagons and pulling one wagon when two wagons that were pushed derailed in a steep curve. When perceiving the derailment, the shunting foreman immediately stopped the shunting unit. The derailment took place at a slow speed and hence the resulting damage was relatively slight.

The derailment was caused by the poor condition of the track. Important lateral pegs, that is, rail joint wear had been generated in the steep curve. Moreover, the insufficient tamping of the track and the probably non-bent rails used in the curve contributed to its poor condition.

In order to prevent corresponding incidents in the future, the Accident Investigation Board of Finland recommends that the company responsible for the maintenance of the track in question draw up a maintenance plan for the railway lay-out specifying the regular maintenance operations to be implemented for the railway lay-out.



C 8/2004 R

Shunting unit and reach truck colliding in Helsinki West Port on 29 June, 2004

On Tuesday June 29, 2004 at 14.30 hrs an accident took place in Helsinki West Port when a reach truck proceeded between the containers and arrived in front of the locomotive of a shunting unit. The locomotive bumped into the flank of the reach truck that advanced to the rails. At the time of the accident the speed of the shunting unit was 21 km/h and the speed of the reach truck, 20 km/h. In the accident the engine driver was seriously injured. The reach truck involved in the accident was damaged as well as the Dv15-type diesel-hydraulic locomotive. The total costs generated by the accident amounted to about €28,380.

The immediate cause of the accident was the driving of the reach truck to the rails from between the containers. As there were containers piled by the rails, the reach truck driver was unable to perceive the approaching train.

The Accident Investigation Board of Finland gives no new relevant recommendations, the intention being that the rails will no more be accessible from between the containers by the rails and that the track area will no more be used for container arrangement procedures. The Accident Investigation Board of Finland underscores that corresponding preventive actions should be con-

sidered by other ports in Finland, as well, so as to prohibit a simultaneous utilization of the same areas by work machines and railway vehicles.

Recommendations

In 2004 a total of ten new recommendations were issued. Six recommendations were addressed to the Finnish Rail Administration, two to VR-Group Ltd, and two to both the Finnish Rail Administration and VR-Group Ltd. The recommendations concerned track-laying in replacement of old track, the loading methods implemented, orientation training, level crossings, track maintenance and track maintenance instructions and regulations. The recommendations can furthermore be broken down as per target category, as follows:

Rolling stock	0
Track equipment	3
Traffic control equipment	1
Operating directions	6
Rescue action	0

In addition to the Finnish Rail Administration and VR-Group Ltd, also the Ministry of Transport and Communications, the Ministry of the Interior and the Ministry of Social Affairs and Health were represented at the two meetings held in October and concerning the monitoring of the implementation of the recommendations. The participants in the meetings confirmed that seven recommendations had been duly implemented over the year in question. At the end of 2004, the total number of issued recommendations was 194, 121 of which (62%) had been adopted and implemented by the date of the October meetings.

Rail investigations in 2000–2004

The below Tables specify the accidents, incidents, and hazardous situations investigated by the Accident Investigation Board over the past five years, as well as the relevant personal injuries.

Accidents investigated		2000	2001	2002	2003	2004	TOT
Serious accidents (A-investigations)	Collision	-	-	-	-	-	0
	Derailment	-	-	-	-	-	0
Other accidents (B- and C-investigations)	Collision	3	4	3	2	1	13
	Derailment	5	6	4	8	6	29
	Occupational accident	3	2	-	-	1	6
Incidents (B- ja C-investigations)		-	1	4	1	2	8
TOTAL		11	13	11	11	10	56



Personal injuries		2000	2001	2002	2003	2004	TOT
Deceased	Passenger	1	-	-	-	-	1
	Personnel	-	-	-	-	-	0
	Total	1	0	0	0	0	1
Seriously injured	Passenger	1	1	-	-	-	2
	Personnel	4	6	-	-	2	12
	Total	5	7	0	0	2	15
Slightly injured	Passenger	18	44	-	-	-	62
	Personnel	1	9	-	4	-	14
	Total	19	53	0	4	0	76
TOTAL		25	60	0	4	2	91



MARINE

In 2004 sixteen marine accident investigations were commenced, as well as a safety study on fatigue on the navigation bridge that was based on accidents investigated earlier. Serious personal injuries occurred in two of the accidents. One leisure boat accident involving the drowning of two persons is under investigation. Furthermore in connection with a life boat drill at Hanko port, an accident occurred that resulted in two crew members being seriously injured.

Among the investigated accidents, three resulted in a total loss of the vessel. A pusher-barge combination drifted in a storm to the Swedish coast and sank. On the Polish coast a trawler sank. Of all accidents, eight were groundings, and in one grounding accident, the vessel also hit the Olavinlinna floating bridge. The grounding of the Suomenlinna II passenger ferry as well as six other incidents of the same vessel were included in one investigation. Two Finnish trawlers sank and one had an incident; these accidents are under investigation.

In 2004 altogether 27 marine accident investigations were completed and reported on, as well as four preliminary studies. The accidents and incidents included 17 groundings, 3 collisions, the sinking of 2 vessels and a fire in the nightclub of a vessel. Two of the investigated incidents involved the Finnish roro-vessel in a hazardous situation in the Atlantic Ocean. The CAMILLA roro-vessel suffered an engine breakdown off New Foundland when a storm approaching, and its crew had to be evacuated by a Canadian rescue helicopter. The roro-vessel TRADEN had a dangerous heel in the Atlantic, when its cargo moved in a heavy storm. The report of the safety study on "Marine Distress and Safety Radio Communications" was completed. It analyses defects and shortcomings observed in radio communications in 22 marine accidents and incidents that had been investigated earlier.

The investigation of 7 of the accidents and incidents was carried out jointly with the flag countries of the ships concerned, or the competent investigating authorities. The cooperation is based on the investigation guidelines issued by the International Maritime Organization (IMO). The accident investigation authorities of Sweden, Denmark and Canada participated in the co-operation.

In addition to the investigation concerning the emergency radio communications referred to above, two safety studies were conducted firstly on the results obtained in the investigation of pilotage accidents and secondly, on the safety of domestic passenger vessel traffic in the light of investigated accidents and incidents. Finally at the end of 2004, a safety investigation on fatigue on the navigation bridge was commenced.

In 2004 a total of 36 safety recommendations were issued, 18 of which were addressed to the Finnish Maritime Administration and the remaining 18 to shipping companies, other authorities and pilotage organisation.

A one-day training seminar was arranged for the marine accident investigators in November 2004. In this connection, the marine accident investigations by other countries, presented in the meeting of the Marine Accident Investigators' International Forum (MAIIF), were discussed. Both marine accident investigators of the Accident Investigation Board participated in this meeting held in South-Africa. The Chief Marine Accident Investigator was re-elected the deputy chairman of the MAIIF.

The EU Commission has commenced the preparation of a directive on the investigation of marine accidents. The Chief Marine Accident Investigator participated in a consultation meeting organized by the Commission in Brussels, and the established contacts were maintained with the European Maritime Safety Agency (EMSA).

The full-time investigators presented investigation results of the marine accidents in connection with different occasions in Finland and abroad, e.g. in connection with an ICHCA International Safety Panel in Antwerp, MAIIF meeting, at Kymenlaakso and Satakunta Polytechnics, in two training courses for VTS operators and On-Scene-Commanders, in a training session of Turku District Health Institute and the Finnish Seamen's Union, and in two seminars on marine safety.

Investigations commenced in 2004

In 2004 a total of 16 marine accident investigations and one marine safety study were commenced. The table below includes all accidents and incidents taken under investigation. Among the investigations, 2 were of B and 8 of C category. The investigation of 5 accidents is carried out in cooperation with the Swedish investigation authorities (B 1/2004 M, B 2/2004 M, B 8/2004 M, C 7/2004 M and C 9/2004 M).

Identifier	Date	Title of the investigation
B 1/2004 M	20.1.2004	Roro passenger ship FINNCLIPPER (FIN), grounding at Kapellskär
B 2/2004 M	2.3.2004	Pusher-barge combination HERAKLES-BULK (FIN), hazardous situation and sinking in the Gulf of Bothnia
B 3/2004 M	26.5.2004	Trawler SEA GULL 1 (FIN), sinking off the Polish coast
B 4/2004 M	3.7.2004	Boat accident south of Kirkonmaa, Kotka
B 5/2004 M	21.9.2004	Roro-vessel GLOBAL FREIGHTER (FIN), grounding at Lövskär
B 6/2004 M	9.11.2004	Ms SUPERFAST VII (GR), accident in lifeboat drill at Hanko
B 7/2004 M	12.11.2004	Ms SUPERFAST VII (GR), grounding at Hanko
B 8/2004 M	9.12.2004	Ms ALANDIA (FIN), grounding off Umeå
C 1/2004 M	17.1.2004	Trawler fv BRATTVÅG (FIN), sinking at Pori
C 2/2004 M	27.1.2004	Trawler fv NORDSJÖ (FIN), hazardous situation in the north of the Baltic Sea
C 3/2004 M	16.3.2004	Liaison boat HÖGSÅRA (FIN) and liaison vessel ROSALA II (FIN), collision north of Örö
C 4/2004 M	5.7.2004 - 17.12.2004	Passenger ferry SUOMENLINNA II (FIN), grounding at Helsinki on 5.7.2004, and six other irregular situations in 2004
C 5/2004 M	18.7.2004	River-seagoing vessel KRASNOVIDOVO (RUS), crashing into floating bridge in Kyrönsalmi, Savonlinna



C 6/2004 M	4.8.2004	Ketch VALBORG, grounding in Porvoo archipelago
C 7/2004 M	30.8.2004	Passenger vessel ISABELLA (FIN) and sand barge ROSPIGGEN (SWE), collision off Stockholm
C 9/2004 M	24.11.2004	Ms CASINO EXPRESS (SWE), grounding off Umeå
S 3/2004 M		Fatigue on navigation bridge

Investigations completed in 2004

In 2004 one B-investigation and 26 C-investigations were completed as well as a safety study. The investigation work on one accident was carried out in cooperation with the flag state of the vessel concerned (C 8/2003 M, Sweden), and in one case, the investigating authority of the state of occurrence assisted in the work carried out by the Finnish authority (B 1/2003 M, Canada).

Four investigation reports have also been published in Swedish and in English, and one report exclusively in Swedish.

Identifier	Date	Title of the investigation
B 1/2003 M	23.1.2003	ms CAMILLA, serious incident in North Atlantic
C 7/1997 M	20.8.1997	ms SILJA EUROPA–sailing yacht FLANÖR, collision in Åland archipelago
C 8/1997 M	12.7.1997	ms NAJADEN, grounding off Estonian coast
C 8a/1997 M	12.5.1997	ms SOFIA, grounding at Öresund
C 16/1997 M	1.12.1997	mt CRYSTAL AMETHYST, grounding off Mussalo Harbour in Kotka
C 7/1998 M	4.8.1998	Motor vessel PAMELA, grounding in the Finnish archipelago
C 10/1998 M	29.11.1998	Tugboat DIMITRIS, grounding off Inkoo
C 4/2001 M	15.5.2001	The pusher-barge combination ALFA / PARA-UNO collision with the freighter SORMOVSKIY 118 within a separation zone in Northern Baltic
C 10/2001 M	2.10.2001	ms PAMELA, grounding in Kihti
C 11/2001 M	19.10.2001	Tug EEVA, sinking on Airisto
C 13/2001 M	19.10.2001	ms TRADEN, incident caused by cargo shift in the Atlantic
C 14/2001 M	21.11.2001	Tug boat VOIMA, sinking in port of Kaskinen
C 4/2002 M	1.1.2002	Pusher barge combination ms STEEL–BOARD, grounding at the Kvarken
C 6/2002 M	8.3.2002	ms CINDERELLA, fire in nightclub
C 7/2002 M	11.7.2002	Push barge PUSKU and PÖLLI 7, grounding in Savonlinna
C 8/2002 M	28.7.2002	Passenger vessel AIRISTO SUN, danger situation outside the port of Rauma
C 10/2002 M	31.8.2002	Passenger ferry ms SUOMENLINNA-SVEABORG, collision with quay in Helsinki
C 12/2002 M	20.11.2002	ms TRAVEBERG, grounding in Ruotsinsalmi, off port of Kotka
C 13/2002 M	18.3.2002	ms KAJEN, grounding in Ruotsinsalmi, off Port of Kotka
C 1/2003 M	5.2.2003	Trawler BRIAN KENT, incident at an ice floe off Pori
C 3/2003 M	31.3.2003	ms BIANCA, grounding off Gävle in Själstenarna shallows

C 4/2003 M	11.4.2003	Icebreaker VOIMA, grounding off Helsinki
C 6/2003 M	23.4.2003	ms PAMELA, grounding south of Södertälje in Sweden
C 7/2003 M	14.6.2003	Water bus KAROLINA, grounding and engine failure in Houtskär archipelago
C 8/2003 M	18.9.2003	ms SILJA OPERA, collision with three cargo ships in St. Petersburg
C 9/2003 M	7.11.2003 8.11.2003	Archipelago ro-ro passenger vessel SPOVEN, groundings off Torsholma and near Degerö
C 6/2004 M	4.8.2004	Ketch VALBORG, grounding in Porvoo archipelago
S 1/2002 M		Marine distress and safety radio communications



B 1/2003 M

ms CAMILLA, serious incident in North Atlantic on 23 January, 2003

On Wednesday January 23, 2003 the Finnish ro-ro cargo vessel CAMILLA sent a preliminary ECAREG message of possible distress situation. She was drifting without propulsion after an engine break down in the North Atlantic Ocean some 240 miles off Newfoundland in position 46° 54,7' North and 46° 50,9' West. In the message it was said that CAMILLA is trying to get assistance to tow her. As there was no help available and the weather conditions were rapidly changing worse the master decided to ask for evacuation to secure the crew. The crew was evacuated by Canadian Rescue helicopter to St. John's, Newfoundland. The operation was in ultimate limits of the helicopters operational range.

Later the vessel was towed to Conception Bay, Newfoundland by a salvage company. From there she was towed to St. John's. The vessel was sold to new owners in summer 2003.

The investigation commission concluded that the most probable cause for the engine break down was imperfect lubrication of the main engine. The imperfect lubrication was a result of several occurrences.

The investigators do recommend that Re-activation after lay up should be done following all the guidance and recommendation given by the Class. The investigators do question the usability of the conventional open lifeboats and inflatable life rafts in Ocean areas

C 7/1997 M

ms SILJA EUROPA—sailing yacht FLANÖR, collision in Åland archipelago on 20 August, 1997



Finnish passenger-car ferry ms SILJA EUROPA and German sailing yacht FLANÖR collided on 20.8.1997 at about 14.15 close to the fairway edge mark Rågrund in Åland archipelago. There was dense fog at the time of collision, visibility being about 200 meters.

FLANÖR was on voyage from Sottunga towards Mariehamn with a crew of two. She was approaching Rågrund from Northeast along the fairway and from there the intention was to turn to the fairway leading Northwest. She passed the Rågrund edge mark at a distance of about 25 metres. Soon after a fog signal was heard and the FLANÖR navigator saw on the radar screen a huge echo which was fast approaching.

The FLANÖR navigator gave order to the helmsman to turn FLANÖR 180 degrees to port because she thought that the turn to starboard was not possible due to the closeness of the edge mark. A ship was seen astern during the turn. The navigator ordered more turn to port and an increase of speed. At first it looked like that the ship, which later turned out to be SILJA EUROPA, would pass FLANÖR on the starboard side. When FLANÖR was at the ferry midship she was felt as if to be sucked alongside the ferry. The port side of the SILJA EUROPA and the starboard side of the FANÖR collided.

At the time of the incident SILJA EUROPA was on the scheduled voyage from Stockholm to Turku. There was no other traffic visible on the ships radar before the accident. The watch officer started the turn round the Rågrund edge mark at 14.13. Suddenly he saw an echo on his radar screen south of the edge mark. The watch officer did plot the echo and after 30 seconds he got the target's direction and speed on the radar display. The vector displaying direction and speed of the target did show that the target was at collision course at a distance of about two cable lengths (370 meters).

The watch officer changed over to hand steering and turned rudder hard to starboard. After this he saw a sailboat very close at the port side of SILJA EUROPA. First the sailboat disappeared below the bow but after a moment it was seen alongside. By turning the rudder hard to port he did prevent the SILJA EUROPA's stern to collide with the FLANÖR.

The starboard side of the FLANÖR was damaged and she started to leak. The crew of the FLANÖR sent MAYDAY message, shot emergency rockets, launched the liferaft, and started to pump out the water. SILJA EUROPA stopped immediately and launched her MOB boat. This MOB boat was the first to arrive alongside FLANÖR in six minutes. The Frontier Guards's helicopter and its boat were alerted and several other ships reported themselves to the rescue operation. Alerted rescue units arrived to the scene within 13 minutes.

It was soon observed that there was no danger of sinking. The crew of the FLANÖR was taken on board the Frontier Guard's boat which then started to tow the FLANÖR to Degerby.



C 8/1997 M

ms NAJADEN, grounding off Estonian coast on 12 July, 1997

In summer 1997, bound from Kotka, Finland for Hamburg, Germany a Finnish Feeder-class cargo vessel grounded on 12.7.1997 off Estonian coast. The officer on watch had fallen asleep soon after he took the watch. He had not altered the course to follow the traffic separation but the vessel carried on across the Gulf of Finland over three hours until she grounded. The bottom of the vessel was damaged. Those onboard were not hurt and no environmental harm was caused.

The Accident Investigation Board intends to publish a summary of a number of similar accidents that were essentially caused by a person's deteriorated working capacity, that is, by fatigue of the officer on watch.



Photo: © Petri Sipilä

C 8a/1997 M

ms SOFIA, grounding at Öresund on 12 May, 1997

The Finnish feeder-class cargo ship SOFIA deviated off her planned track to low water area some 3 miles NW off Hälsingborg. The mate acting as the officer on watch was alone on the bridge and he had fallen asleep just before the narrow sound between Hälsingborg and Elsinore. The ship got stuck to the bottom but no damage occurred to her bottom plating. After unloading the cargo the ship was taken off to deeper water and loaded her cargo again and then sailed according the original plan to England. No environmental damage was caused.

The Accident Investigation Board intends to publish a summary of a number of similar accidents that were essentially caused by a person's deteriorated working capacity, that is, by fatigue of the officer on watch.



C 16/1997 M

mt CRYSTAL AMETHYST, grounding off Mussalo Harbour in Kotka on 1 December, 1997

Chemical tanker CRYSTAL AMETHYST, operated by HOL Maritime I A.S. of Luxembourg was shifted from Hamina oil harbour to Kotka Mussalo on the 1st of December 1997. A cargo of 785 tons of Nonyl Phenol Ethoxylate had been loaded in Hamina. A pilot was on board. The speed of the wind varied in between 12-25 m/s during the voyage.

The pilot had boarded the vessel at 16:00 about 10 minutes before the departure. Wind speed at the moment was about 17 m/s. The pilot recommended the assistance of the tugboat. Master wanted the tugboat to be only in standby. However, he accepted pilot's proposal and the tug was

made fast as the wind speed was 17 m/s. Master informed the pilot that no tug assistance was needed for berthing at Kotka Mussalo harbour.

While approaching the Mussalo harbour the pilot and Master discussed and agreed upon where to turn the vessel in order to make a stern ahead approach to the quay. The turn was completed outside the south buoy in front of the harbour. The pilot and the master didn't discuss the ordering of tug. The wind was about 15 m/s.

Master and the pilot stayed on the bridge. Master took care of the engine settings, rudder and the bow thruster.

Rather soon it became apparent that berthing the vessel in light load condition will not succeed. The wind speed had increased. The wind turned the ship to a southerly heading with only a small distance to the opposite quay. Master managed the vessel out from the basin with difficulty. On the way out from the basin CRYSTAL AMETHYST touched a vessel made fast to the quay and also touched the end of the quay, according to the pilot, while manoeuvring out from harbour.

Master concentrated on steering and adjusting the propeller pitch. The pilot gave steering commands using rudder angles. Pilot's reference of position was a green buoy, which he assumed to be the northerly one of two buoys. The chief mate came on the bridge at 18:09 and took the helm. At 18:10 CRYSTAL AMETHYST ran aground at Matinmatala. The pilot's reference of position had been the buoy in north westerly direction instead of the assumed one in northerly direction.

There were no spill of cargo or fuel oil to water. The cargo of Nonyl Phenol Ethoxylate is toxic and the possibilities for countermeasures are not good if there is a spill to water.



C 7/1998 M

Motor vessel PAMELA, grounding in the Finnish archipelago on 3 August, 1998

Finnish motor vessel PAMELA ran aground in Stångskär en route from Korppoo to Olkiluoto on 3.8.1998. The master was acting as the officer on watch as he fell asleep. The vessel got damages to her bottom plating. No environmental harm occurred.

The Accident Investigation Board intends to publish a summary of a number of similar accidents that were essentially caused by a person's deteriorated working capacity, that is, by fatigue of the officer on watch.

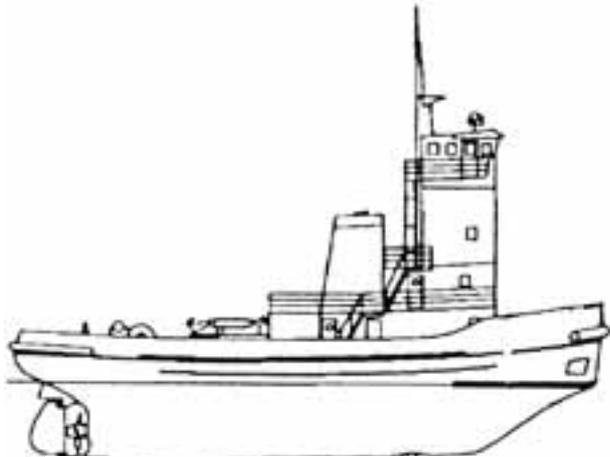


C 10/1998 M

Tugboat DIMITRIS, grounding off Inkoo on 29 November, 1998

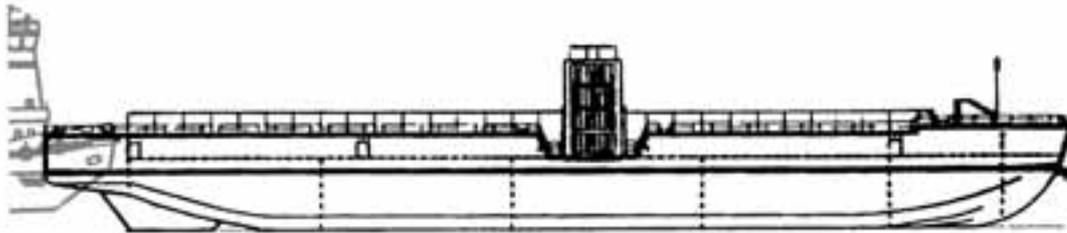
Tugboat DIMITRIS and the towed barge MULTIBRAVA, with coal cargo, was on her way from Vysotski Russia to Inkoo Finland on 29.11.1998. The pilot boarded the tugboat at the Porkkala pilot embarking position at 00:05 am. The prevailing weather conditions were unstable. The weather forecast had predicted the conditions: moderate visibility and possible snow fall. Visibility went down to 0,5 Nm - 0,7Nm. The tow proceeded on the Inkoo fairway until the next buoys 7 and 8 were abeam. For some reason the wrong 3.7 meter fairway towards Gåsö was followed. The mistake was observed after about half an hour and a few minutes before the tugboat run aground. The aft anchor from the barge MULTIBRAVA was let go to slow down the speed. DIMITRIS also slowed down. After some five minutes the grounding of the tugboat was felt on board. The barge passed the tugboat on the port side and broke the towing cable. The position of the grounding/DIMITRIS was south of the Gåsöklobben. The barge MULTIBRAVA was anchored west of Gåsöklobben. Personnel injuries and environmental damages were avoided in this accident.

During the investigation it was found out that the steering along the wrong fairway was not observed in time because safeguards were missing from the navigation. Not all the navigational aids nor the fairway knowledge were used with sufficient rigorousness. The communication and exchange of information formed a problem on the bridge. Previous safety recommendations have been issued on those and have been referenced by the investigators.



C 4/2001 M

The pusher-barge combination ALFA / PARA-UNO collision with the freighter SORMOVSKIY 118 within a separation zone in Northern Baltic on 15 May, 2001



The pusher barge combination ALFA / PARA-UNO collided with the freighter SORMOVSKIY 118 in the separation zone on the northern Baltic. The damages were minor. ALFA, owned by Paratug Ltd in Turku, Finland, had left Gotland for Inkoo in Finland. ALFA. The owner of SORMOVSKIY 118 is Onego Shipping from Petrozavodsk, Russia. She was bound for St. Petersburg.

The conditions were good and there were no technical problems. It was found that the Rule of the Road was not followed. Just before the accident the look-out was in ALFA's bridge but he did not know how to manoeuvre the vessel in the critical situation. Shortly before the OOW had to leave the bridge though the situation needed intensive observing and possible action. The investigators do not give any recommendations.



C 10/2001 M

ms PAMELA, grounding in Kihti on 2 October, 2001

Photo: © Tapio Karvonen

The Finnish general cargo vessel PAMELA sailed at 16:35 October 1, 2001 from Olkiluoto port and was bound for Klaipėda, Lithuania. She had a cargo of 975 tons. She headed through the Archipelago Sea following the Kihti fairway. At 02:55 hours the light of Tosholmskobben was

passed and the vessel was headed to the light sector of Snöbådan at the southern Kihti area. The Officer on Watch was alone in the bridge as the look out had been sent to call up the next watch. The OOW navigated optically using the fairway lights as well as using the radar. The bridge was equipped with an electronic chart but the system was not in use. The equipment was out of order. As the vessel was in the white sector of Torsholmskobben light, her autopilot was set on course heading to the Snöbåda light. By using the radar and also a search light the OOW tried to find the spar buoy covering a shallow on the eastern side of the fairway. To his surprise the vessel grounded lightly to the shallow.

The damage control took place preliminary in nearby area and later in the port of Naantali with the attendance of classification society's representative. The damages were minor and the vessel got a permission to carry on trading.

The Accident Investigation Board intends to publish a summary of a number of similar accidents that were essentially caused by a person's deteriorated working capacity, that is, by fatigue of the officer on watch.



C 11/2001 M

Tug EEVA, sinking on Airisto on 19 October, 2001

Small tug EEVA was pushing a little working pontoon on Airisto in the archipelago sea area near Turku when she suddenly sank in the evening at about 21 hours between the isles Vepsä and Rymättylä. To the Master's surprise the tug had taken so much water. He could not prevent sinking with the inadequately working pumps available. While the Master tried to pump water out the tug drifted about one nautical mile southwards. During the drifting the Master did not make emergency call. When the tug had sunk the Master succeeded to climb on the working pontoon after which he tried several times to make the emergency call by his mobile phone until he succeeded on third time at 22:12. The Master had been on the pontoon for about an hour and half before the SAR units arrived to the scene. He was rescued by the patrol boat of police half an hour after the emergency call.

The tug was salvaged and inspected after the accident. The sealant of the propeller tube was missing. The sinking of the vessel was assumed to have started with the leak through the propeller tube. The sinking was, in addition to the leak, due to an initial heel caused by the shifted deck cargo and the water in the hold. After heeling the aft cargo hold was filled by water by the

waves through the hatch opening. The investigator presents no safety recommendations, but highlights the importance of good safety attitudes and practises as well as preparedness for accidents.



C 13/2001 M

ms TRADEN, incident caused by cargo shift in the Atlantic on 19 October, 2001

Ro-ro cargo vessel ms TRADEN, en route from Valencia to Norrköping, occurred in emergency due to a severe cargo shift. The cargo shifted when the ship got into a storm for more than two days and into exceptionally troublesome confused seas.

The cargo shift took place in stormy Atlantic after passing Portugal, when containers on weather deck and Pendolino railway carriages on main deck came loose from their lashings. The containers came loose when fastenings on the deck broke, and the railway carriages shifted because trestles below them had collapsed.

The crew managed to secure most of the loosened cargo. The ship was in emergency due to an apparent risk of capsize, and a general alarm for “ship abandon” had been given. One life raft was lost during launching, and safe abandoning of the ship was not possible. The storm relented before an accident took place and the TRADEN was able to proceed with own power to haven.

Containers on the weather deck were fastened to D-rings, which were too weak. The D-rings had become thinner but did not break, whereas welding junctures of D-ring fastenings were torn. After the emergency the D-rings have been replaced with new ones, and fastenings have been made clearly stronger than the broken ones.

Loosening of the Pendolino railway carriages was a consequence of the manner to fasten the trestles to the deck. There were degrees of freedom for motions / free unfastened motion directions without fastenings at all, and therefore the loose trestles’ legs were able to move and the trestles collapsed.

The shipper had determined principles and implementation of cargo securing but the master criticized about supporting the railway carriages on wooden beams. However, the critics was not taken into account in the final lashing.

The ship was relatively lightly loaded and this was compensated with ballast. The draught was, however, quite small in the current loading condition, and the ship was very stable, which increased loads acting on cargo. Bilge keels have been removed during previous docking because of ice damage, which also increased roll motion and loads on cargo.

The ship carried a Cargo Securing Manual according to the IMO Resolution A.714(17) and accepted by the Finnish Maritime Administration. However, as the manual was obscure, very extensive and partly inadequate, it was not in use. It lacked partly essential and guiding data of lashing of cargo.

Accident and success lie sometimes very near each other. Decisions, orders, and actions taken can be the same, but they can lead coincidentally to a different end result. Accident investigation cannot explain this difference. In case of the TRADEN it can be only stated that master's decisions and crew's actions were correct. They saved the ship and the crew. It is possible, however, that the actions taken had not helped. An accident was nearby.



C 14/2001 M

Tug boat VOIMA, sinking in port of Kaskinen on 21 November, 2001

Tug boat VOIMA, owned by Arctic Towing Oy, got a list and sunk when assisting a general cargo vessel in port of Kaskinen, November 21, 2001.

En route from Pori to Pietarsaari VOIMA had stopped in Kaskinen to avoid prevailing strong wind. She was at berth when the master got a request to assist an incoming vessel. Russian cargo vessel PIONER KARELII was approaching. The decision to use tug assistance was made at 20:00 o'clock and VOIMA proceeded to the fairway at 20:20. VOIMA was the closest tug boat available. The vessels met and following the pilot's orders, VOIMA took the tow line from the PIONER KARELII. The design and technical characteristics of the tug boat set operational limits in assistance specially when assisting a vessel with her own propulsion. The master of the tug boat did not have practical experience in port assistance with this tug boat.

PIONER KARELII was steaming with 6,5 knots' speed and VOIMA followed on her side with same speed. No operational plans were made or given. After passing the Fishing harbour PIONER KARELII's engine was stopped but she started to swing off course. With short engine command ahead she could be steered back on course. This was repeated again before the buoy gate of deep harbour. The speed of the vessel was less than 5 knots and the pilot ordered the tug to start pulling straight into stern direction. At the same time PIONER KARELII started to swing and probably her engine was given an ahead command. VOIMA's after deck went under water and she got a list. The two deckhands were washed overboard. Soon after this also the master

and mate found themselves in the sea. VOIMA finally sunk at 21:08 hours when the tow line was cut onboard PIONER KARELII.

The rescue activity was started quickly by the pilot boat which was in the nearby pilot station. All four men were rescued at the last minute. They all suffered from hypothermia. PIONER KARELII was later berthed successfully.

The main cause of the accident was the fact that the tug boat was not suitable for assisting in this dangerous way pulling opposite to the vessel in assistance having too much speed ahead. There was a lack of communication between the two vessels specially concerning the engine commands. The tug boat's stability did not fulfil the requirements and the crew was inexperienced in harbour assistance. The tug boat capsized and sunk quickly because the engine skylight was open.



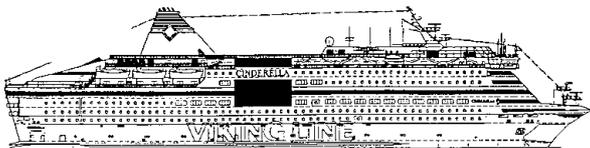
C 4/2002 M

Pusher barge combination ms STEEL-BOARD, grounding at the Kvarken on 1 January, 2002

Kuva: © ESL-Shipping

The pusher barge combination STEEL-BOARD grounded on January 1, 2002 at the Kvarken en route from Vysotskij, Russia to Raahe, Finland. The chief officer being the Officer On Watch had fallen asleep and did not conduct the course change according the route plan in Nordvalen. He was alone in the bridge because he had relieved the look out to other work onboard. The investigation tried to find out the factors, which can be identified to cause such performance impairment that led the OOW make his decision to work alone and why he fell asleep. The investigators do not make any recommendations on this case. AIB Finland will later publish a safety study on numerous accidents at sea in which the main contributing factor has been the fatigue of the OOW.

The Accident Investigation Board intends to publish a summary of a number of similar accidents that were essentially caused by a person's deteriorated working capacity, that is, by fatigue of the officer on watch.



C 6/2002 M

ms CINDERELLA, fire in nightclub on 8 March, 2002

On a cruise between Tallinn, Estonia and Helsinki, Finland a fire broke out in the night club of passenger car ferry CINDERELLA. In the early morning hours at 02:30, there were many passengers in the night club. The fire was noticed soon because of the flames and smoke, but the exact position of ignition was not discovered. The stage curtain which was used in the fire fighting caught fire and the fire escalated. The night club was filled with smoke.

With the fast fire fighting by the crew the fire was extinguished in an half hour. There were no personal injuries but the passengers were evacuated from the night club and the cabins above and below the night club. The evacuation went smoothly and the passengers stayed calm.

The stage area was badly damaged by the fire and some areas below the night club were damaged by the water used in fire fighting. The vessel arrived to Helsinki before her scheduled time. After damage control, repair and investigation CINDERELLA got a permission to continue her cruise program within the scheduled time table.

The fire had started in a clavilux rack due to over heating. No single cause to over heating could be defined.

The investigators do not address any specific recommendations but do want to highlight some important views to guarantee a high standard on fire safety on board.

C 7/2002 M

Push barge PUSKU and PÖLLI 7, grounding in Savonlinna on 11 July, 2002



Tug boat PUSKU was pushing a combination of two barges connected to each other side by side, through the fairway of Kyrönsalmi in Savonlinna on 11.7.2002. The bigger barge called PÖLLI 7 carried mainly birch logs and the smaller barge a timber - handling machine. At the castle Olavinlinna when manoeuvring through the strait of Linnasalmi, the bow of the barge PÖLLI 7 hit the guide fitted on the shore rock of the isle of Linnasaari. As a consequence, the combination turned to the right and drifted into the shallows of the isle of Tallisaari and grounded. The barge PÖLLI 7 got a leakage and a list. A half of logs rolled in the stream and the timber handling machine was

damaged. The tug managed to move the barges to the shore of a nearby isle. Floating logs endangered other traffic until they were collected with the help of additional forces. No persons were in danger during the accident.

The accident resulted from the steering of the too wide tug-barge combination having poor manoeuvring capabilities through a difficult navigable strait. Moreover, the crew had manoeuvred this type of combination on a few occasions only and the routine to do it had not accumulated.



C 8/2002 M

Passenger vessel AIRISTO SUN, danger situation outside the port of Rauma on 28 July, 2002

The passenger vessel M/S AIRISTO SUN got into a danger situation outside the port of Rauma while transporting the passengers to the tourist destinations according to the time table. The journey began from Syväraumanlahti to Kuuskajaskari at 18.15 in 28.7.2004 and no troubles were found during the first 15 minutes. Then the indicator of cooling water temperature in the engine began to alarm. Master stopped the engine according to the advice given on the phone by the ship-owner. Then he called via VHF-radiotelephone the coast guard station in Rauma at 18.35 o'clock. Master estimated that the vessel would probably drift in ten minutes aground and he told it to the coast guard patrol, and he had a wish that the patrol could get in time to give assistance.

By using the maximum speed the patrol came on scene at the same time when AIRISTO SUN hit aground the first time. The patrol boat began to tug AIRISTO SUN at 18.55. After 15 minutes tugging M/S AIRISTO STAR, another passenger vessel of the shipping company, came alongside AIRISTO SUN and the passengers proceeded via gangway from the damaged ship to the whole ship. They didn't have any lifejackets on.

After this operation the patrol boat went on tugging AIRISTO SUN towards Rauma harbour. M/S HOPPE, a boat of the Finnish life saving association, took the tug in front of Rauma harbour and tug AIRISTO SUN in harbour for reparation.



C 10/2002 M

Passenger ferry ms SUOMENLINNA-SVEABORG, collision with quay in Helsinki on 31 August, 2002

Passenger ferry ms SUOMENLINNA-SVEABORG had departed from Suomenlinna according to the schedule on Saturday August 31st 2002. Onboard were 131 passengers and a crew of four. When the master had turned the vessel towards the quay at the end of the journey he observed, that the propeller pitch control was not responding. He switched the control to emergency mode, which did not work. At about 18:15 the vessel collided at a speed of 6 knots with the fender of the quay and she bounced back about its own length.

Altogether 12 persons needed first-aid or hospital treatment. The two most severely injured passengers had descended the stairs and fallen down due to the force of the collision. The vessel received minor damage.

The immediate cause of the collision was established to have been a shortcut in the leads of the lighting of the pitch control display. The shortcut for its part caused a relay in the control system not to function. The chafing and temporary contact had been a consequence of the vibrations of the vessel.

As contributing factors were observed problems related to the pitch control retrofit carried out in 1995 on the vessel, which originally had been built in 1952. The ship owner actions on the recurring faults was found to be inadequate.

As safety recommendations it has been released that both the ship owner and the Finnish Maritime Administration should improve their roles so that the safety management system would better remedy the observed technical faults and deficiencies in operational practises.



Photo: © Suomenlahden merivartiosto

C 12/2002 M

ms TRAVEBERG, grounding in Ruotsinsalmi, off port of Kotka on 26 November, 2002

The cargo vessel TRAVEBERG left Halla harbor November 26, 2002 at 02:35 a.m. Halla is situated in eastern Finland close to the port of Kotka. TRAVEBERG run aground 20 minutes after her departure when she was turning into a new fairway leading to the narrow sound of Ruotsinsalmi. She was in ballast and had no cargo. TRAVEBERG sailed under the Gibraltar flag and her owner is Rederei Lutz Jeske from Rendsburg, Germany.

The master and the pilot were alone on the bridge. The visibility was reduced to 150-800 meters by drizzle and fog. The wind was southwest 10 m/s. The turn to the new fairway was delayed both to poor visibility and a poor radar picture.

The investigation turned the attention to the fact that the combination of a reduced manning with ergonomically poor and cheap Non-Follow Up steering system is hazardous. This combination has become generally accepted in pilotage. When the personnel responsible for the pilotage accept this working habit the dangers can not be anticipated. The investigation recommends a check in the working habits.



C 13/2002 M

ms KAJEN, grounding in Ruotsinsalmi, off Port of Kotka on 18 March, 2002

The German cargo vessel ms KAJEN left Emden harbour on March 14, 2002 at 14:06. Draught was 4.5 m fore and 5.2 m aft. The vessel had cargo of pulp. The destination in Finland was Halla port in Kotka. The vessel was owned by a German Shipping Company Jan Nagel Schiffahrts KG.

KAJEN run aground on March 18, 2002 at 01:30 when turning into the Ruotsinsalmi fairway. The primary cause of the accident was the ice condition. Fast ice floes had drifted to the fairway and ice floes had frozen together. When the vessel was turning into the fairway she steered strongly out of the fairway while hitting the ice floes. The turn could not be controlled with opposite helm and it was too late to stop her. KAJEN run aground at very slow speed with engines full astern.

The accident revealed deficiencies with the working habits between the pilot and the officers. This repeats from accident to accident. The unofficial working habits have a silent approval of seafarers, authority and ship owners. According to the opinion of the accident investigation the current customary working practices have diverged from the aim of the regulations.

The bridge personnel followed the common working practices. According to these they have acted correctly. Working habits have arisen from the circumstances and from the pressure created by economical pressures. These practices have become permanent and the seafarers can not correct these by themselves anymore. For this reason the investigation repeats the recommendation of TRAVEBERG¹ to set up a working group for pilotage practices in general.



C 1/2003 M

Trawler BRIAN KENT, incident at an ice floe off Pori on 5 February, 2003

On 5.2.2003, a steel trawler BRIAN KENT from Pori, Finland, crashed into an ice floe at a distance of about 35 nautical miles northwest of Reposaari. As a result of the incident, the bow of the trawler was damaged and the collision bulkhead behind the fore peak retracted and partly came loose from the coaming. The fore peak and the fore hold behind the collision bulkhead were entirely covered by water.

The crew of BRIAN KENT notified the incident to the West Coast VTS Centre which again advised MRCC Turku of the situation.

MRCC Turku sent a pilot cutter from Pori Pilot Station to the scene of the incident. Also Coast guard personnel from Pori Coast Guard Station boarded the pilot cutter. BRIAN KENT was hence escorted by the pilot cutter to Reposaari harbour.

The corresponding investigation conducted disclosed that the frames in the fore peak of BRIAN KENT failed to be appropriately fixed in the keel. In fact some frames ended at a distance of several hundreds of millimetres before the keel. As a result, the bow construction was weak.

¹ Investigation Report C 12/2002 M ms TRAVEBERG, Grounding in Ruotsinsalmi, off Port of Kotka, on 26.11.2002.

BRIAN KENT had sailed under the Danish flag over the major part of her service life. The relevant Danish maritime authorities were enquired any such repairs eventually had been made in the bow area of the vessel that had required a cutting of the frames. No registered indications of such repairs were found. Considering the advanced state of corrosion displayed by the frames, they necessarily have to have featured this shortcoming already over a very long time. This structural defect had failed to be discovered in the regular inspections of the vessel. Actually as judging by the state of corrosion of the bolts of the manhole that opens to the fore peak, it is quite possible that in connection with the inspections carried out, the manhole had never been opened.

**C 3/2003 M**

ms BIANCA, grounding off Gävle in Sjalstenarna shallows on 31 March, 2003

The general cargo vessel BIANCA run aground on March 31, 2003 at 0504 hours. The grounding took place in the Swedish territorial waters north of the Gävle fairway in the Sjalstenarna shallows. BIANCA hit the ground in to the eastern end of the shallow with heading 287 degrees. She got damages to her hull, leakages to bottom tanks as well a serious one in to the engine room.

The OOW fell asleep and the look out did not act, as he did not realise that the OOW was sleeping in his chair. The technical alerts were not functioning, as there was an assembly fault in the alarm system. No one had noticed that the alarm system did not work.

The fatigue of the OOW and his falling asleep follows the same scheme as numerous other groundings of Finnish cargo vessels during the last years. In all these as well as in the BIANCA case the contributing factor has been the lack of rest and lack of management of the bridge teamwork, i.e. the look out is not used effectively. The breaking of ones circadian rhythm makes it difficult to stay awake during the late night and early morning hours. This was the case also with BIANCA's grounding.

The Accident Investigation Board intends to publish a summary of a number of similar accidents that were essentially caused by a person's deteriorated working capacity, that is, by fatigue of the officer on watch.



C 4/2003 M

Icebreaker VOIMA, grounding off Helsinki on 11 April, 2003

The Finnish Icebreaker VOIMA was assisting outside of Helsinki 11th April 2003. Quite strong easterly and south-easterly wind forced the ice to move northwest and caused problems to the traffic on Porkkala archipelago fairway as well as in the entrances of Helsinki. The traffic off Helsinki began to jam, especially the ships with weak ice strengthening were in difficulties. The duties the icebreaker VOIMA during the night of 11th April increased and the risk of traffic jam did exist.

According to the agreement between the master of VOIMA and the chief of the pilots the ships of weak ice class were not allocated to the fairway of Porkkala because of the moving ice. The ships were ordered out to the sea via Harmaja. Without a prior notice and as a surprise to VOIMA the assistance for the outbound weak ice class vessel ms TANJA was needed. TANJA was not able to follow the trace of VOIMA, but got fastened in the ice two cable lengths east of the Ulkomatala edge mark. VOIMA did not begin the tow of TANJA at this stage.

After TANJA had got fastened in the ice VOIMA continued her way towards the ships laying in the ice a few miles southwest. Helsinki VTS warned VOIMA about TANJA's close position to the Ulkomatala shallow and later about her drift towards it. After having interrupted the assistance of the vessels further, VOIMA returned to assist TANJA. During these assisting attempts TANJA had drifted north-west among the drifting ice closer to Ulkomatala. When taking TANJA into tow, which took longer than anticipated, the icebreaker grounded 11th April 2003 at 04:50 o'clock. No leaks were observed.

The contributing factors to the accident were found to be the vague and jammed traffic situation, the poor co-operation of the bridge team caused by large amount of radio traffic and the lack of guidelines for the co-operation between the organisations supporting the icebreaker assistance. Other safety observations concern the possible fatigue, the organisational changes in the Finnish Maritime Administration and the effect of the exemptions from traffic limitations.

The safety recommendations issued by the investigation team deal with the guidelines for co-operation within the administration concerning winter navigation and icebreaker operation and the training of the bridge teams in the equipment familiarisation.



C 6/2003 M

ms PAMELA, grounding south of Södertälje in Sweden on 23 April, 2003

The Finnish coaster ms. PAMELA run aground at 02.27 hours on April 23, 2003 south of Södertälje, Sweden. She got leakages in her fore peak. There were no other damages. As the fore-peak leaked empty, PAMELA re floated without assistance. After a thorough inspection the maritime inspectorate gave permission to tow her to Stockholm for repair. It was found out that the watch keeping arrangements were not according the normal practice. Fatigue was found to be one of the contributing factors leading to this accident.

The Accident Investigation Board intends to publish a summary of a number of similar accidents that were essentially caused by a person's deteriorated working capacity, that is, by fatigue of the officer on watch.



C 7/2003 M

Water bus KAROLINA, grounding and engine failure in Houtskär archipelago on 14 June, 2003

KAROLINA was on her way from Näsby, Houtskär to Äpplö island, when at 3:40 p.m. she grounded on a islet at Ramsö area. The vessel upsurged on to the rocky islet. The master made attempts to re float her by using the main engine without success. With his mobile phone master called a local taxi boat to assist him. When the attempt with taxi boat's help was found unsuccessful the local fire brigade was called on site. The fire brigade patrol boat towed KAROLINA off the islet and the master continued his trip after making a visual inspection for possible leaks.

Some five hours later, just after midnight, the master sailed to Houtskär island to pick up some passengers according the contract he had made. After the passengers boarded KAROLINA pro-

ceeded from Näsby to Bockholm. When passing Kalvholm an alarm signal sounded and soon after this the engine stopped and did not start again. The vessel was anchored and the master called with his mobile phone the fire brigade patrol boat. KAROLINA was towed to Roslax pier and the passengers arranged their travel to their home islands by themselves.

There were no personal injuries and the damages to the vessels hull were minor. The engine was a total loss and had to be replaced by a new one.



C 8/2003 M

ms SILJA OPERA, collision with three cargo liners in St. Petersburg harbour on 17 September, 2003

On September 17, 2003 Ms Silja Opera sailing under the Swedish flag, crashed into three cargo liners in St. Petersburg harbour. The vessel was travelling from St. Petersburg to Helsinki.

The accident was investigated by the relevant authority of the flag country (Sjöfartsinspektion). Risto Repo, Chief Investigator of the Accident Investigation Board of Finland, participated in the investigation as an observer.

As specified in the investigation report of Sjöfartsinspektion, the accident was caused, e.g. by the following circumstances:

1. The position and the movements of the vessel failed to be carefully monitored by the pilot and the navigation bridge crew.
2. Poor communication between the bridge crew and the pilot.
3. Current of the canal, bottom suction, and the wind pressed the vessel laterally.

The investigation report is exclusively available in Swedish.



C 9/2003 M

**Archipelago ro-ro passenger vessel
SPOVEN, groundings off Torsholma and
near Degerö on 7 and 8 November, 2003**

The Åland archipelago ro-ro passenger vessel SPOVEN ran aground on her voyage from Lilla Hummelholm to Lappoo on November 7, 2003 at 17:45 hours. She ran aground again on November 8, 2003 at 14:40 hours west of Degerby. She got damaged in the second grounding and had to be towed to a dry dock in Mariehamn. The causes of the groundings were poor visibility and the routines in navigation. In the later grounding a contributing factor was fatigue. The master had been up and awake continuously 32 hours before the grounding.

Onnettomuustutkintakeskus julkaisee myöhemmin yhteenvedon useista samankaltaisista onnettomuuksista, joissa perussyyinä onnettomuudelle on ollut vahtipäällikön toimintakyvyn aleneminen (fatigue).



C 6/2004 M

Ketch VALBORG, grounding in Porvoo archipelago on 4 August, 2004

The ketch VALBORG sailed on August 4, 2004 at 12.45 hours from Pirttisaari in Porvoo archipelago to Stora Brokholm. Onboard there were the crew of four and a group of young people in preparation for confirmation. As the master was turning the vessel from Hummelkobba line to northwest to the Ygglasö stern line, the vessel got north of the fairway and grounded at 20.45. Two blanks in the stem loosened and she got a leakage. The situation was kept under control by pumping and VALBORG was able to sail to Tirmo where she was berthed. After diver's inspection VALBORG moved to Helsinki with her own machinery and was taken to dry dock for reparation on August 16, 2004. The basic reason of the grounding was the lack of route planning beforehand. The curve was too gentle and it was not finalized as the vessel reached the narrow part of the fairway guarded by spar-buoys. At the same time the master was dazzled by the sunshine from west. As a contributing factor the investigators found the common habit to corner cut the routes marked in charts. This kind of habit has been found in numerous cases investigated by AIB.



S 1/2002 M

Marine distress and safety radio communications

The investigation of marine accidents and hazardous situations has repeatedly disclosed even serious defects and shortcomings in on-board radio communication. Therefore on June 17, 2002, the Accident Investigation Board decided to appoint a team to investigate the defects and shortcomings discovered in connection with the accident investigation in the on-board radio communications of the vessels. The work team was assigned to draw up a summary of the accidents having displayed such shortcomings, to analyse the defects and shortcomings, investigate their possible causes, and issue recommendations so as to significantly improve the on-board radio communication of the vessels.

Such hazardous situations on which an investigation report had been drawn up were selected for the investigation. Older investigation reports contained no indications of the standard of the on-board radio equipment of the vessels or any detailed information on how the radio communications were effected. This summary on the on-board radio communications of the vessels mainly focuses on the hazardous situations having occurred within the scope of competence of the Finnish sea salvage.

As only few investigation reports have been drawn up on small-boat accidents, they necessarily had to be excluded from the study. However, the accident suffered by the VIIKINKI small boat is an exception; its investigation report was discussed essentially because the accident was very serious and it disclosed defects and shortcomings in the alarm system in operation in Finland. In fact as a consequence of the accident, the first Sea Salvage Act was enacted in Finland.

The INMARSAT emergency communications were excluded from the investigation, as the emergency alarms of this system do not normally reach Finland. The INMARSAT emergency alarm communications refer to such radio communications between the vessel and the rescue coordination centre that other rescue stations are unable to pick up.

Only few investigation reports exist on cases involving a radio operator as effecting the radio communications in a hazardous situation. In the hazardous situation cases investigated, no problems were disclosed in the radio communication.

Recommendations

The investigation reports on marine accidents completed in 2004 comprised altogether 36 safety recommendations and a few references made to earlier recommendations. Among the recommendations, 18 were addressed to the Finnish Maritime Administration, and the remaining 18 to shipping companies, other authorities and pilotage organisation. Some of the recommendations were addressed to several parties. In addition, the safety investigation "Marine distress and safety radio communications" contains six safety recommendations.

The list below specifies the issued safety recommendations as per subject matter and as per addressee.

Vessel operation directions	8
Pilotage directions	6
VTS directions	1
Directions for emergency radio communications	6
Navigation and route planning	3
Navigation channels and their marking	2
Vessel equipment and facilities	5
Vessel stability	2
<u>Other</u>	<u>3</u>
Total	36
Finnish Maritime Administration	18
Other authorities	9
Pilotage organisation	3
Shipping companies	8
Organizations	1

Marine investigations in 2000–2004

The tables below include the marine accident and failure investigations commenced in 2000-2004 by the Accident Investigation Board. Moreover, the tables present the investigations as broken down as per category of investigation, accident category and resulting injury or environmental damage.

Accidents investigated	2000	2001	2002	2003	2004	TOT
Serious accident (A-investigation)	-	-	-	-	-	0
Other accident (B- ja C-investigation)	10	16	14	11	16	67
TOTAL	10	16	14	11	16	67
Safety studies	-	-	1	2	1	4



Investigations as per accident category	2000	2001	2002	2003	2004	TOT
Grounding	5	6	6	5	8	30
Fire	-	3	1	1	-	5
Sinking	2	2	-	2	4	10
Collision	1	2	4	1	2	10
Other	2	3	3	2	2	12
TOTAL	10	16	14	11	16	67

Investigations as per resulting impact	2000	2001	2002	2003	2004	TOT
Deceased	4	1	4	1	2	12
Seriously injured	-	-	-	-	2	2
Slightly injured	-	1	12	-	4	17
Environmental damage	1	-	1	-	1	3

OTHER ACCIDENTS

"Other accidents" denoted by the letter Y refer to other than aviation, marine or rail accidents. As provided in the Act on Accident Investigation (3.5.1985/373), all serious accidents and catastrophes of any type whatsoever have to be investigated. Furthermore, the Decree on Accident Investigation (12.2.1996/79) provides that a serious incident may be investigated if there is reason to expect the investigation to bring about important information that contributes to the improvement of general safety and the prevention of accidents.

In view of "other accidents", the year 2004 proved very busy, as an exceptionally great number of accidents took place in 2003 and were taken under investigation. In fact in 2003 the investigation of six such accidents was commenced with this investigation work still continuing in 2004. Four of these investigations pertain to accidents in the building sector, one concerns an explosive fire in a steel plant, and one is a safety study of fires with fatal outcome. The investigation of the 2003 accidents was completed with the exception of the steel plant accident which has proven quite complicated. This latter investigation is estimated to be completed over the first half of 2005.

A lively public discussion on safety in the construction business, that had already started in 2003, continued in 2004 upon the completion of the building accident investigations and the publication of the relevant recommendations. Actually the construction business has engaged itself in an efficient cooperation to develop the safety. We can only hope that safety issues will be incorporated as permanent parts in its development action.

The safety study on fatal fires commenced in May 2003 proved to be of current importance. In the investigation, first six fires were studied, and then to render the sampling more significant, a total of 95 fatal fires having occurred in 2003 were investigated. In these 95 fires, altogether 105 persons deceased, which is considerably more than in earlier years. But as based on available sources, the number of fatalities in fires in 2004 was even higher, that is, 115. This regrettable trend and the high fatality rates in comparison with other countries, underscore the crucial importance of the recommendations issued in the safety study report.

In February 2004 an accident in the building sector again took place, and its corresponding investigation commenced. It involved a collapse of the roof of a maintenance building that had been built by voluntary workers at a slalom centre in the municipality of Pohja. The accident investigation was completed in November 2004, and in view of a prevention of such accidents in the future, the investigation report was distributed, e.g. to all municipalities and winter sports organizations and federations.

The most serious road traffic accident in all times in Finland took place in March 2004, when a bus and a heavy-duty vehicle combination collided on trunk highway 4 in Konginkangas, Äänekoski. Altogether 23 persons deceased in the accident and 14 persons were seriously injured. In the accident exclusively the driver of the vehicle combination remained relatively unharmed with only

slight injuries. In June 2004 the Investigation Commission appointed by the Council of State published an interim report that specified the circumstances of the accident, the vehicles involved, the collision itself, and other factors and circumstances having directly impacted the accident. The Investigation Commission still pursues its work in 2005.

Towards the end of 2004, South-East Asia was struck by an earthquake-tsunami catastrophe causing a huge number of human victims. As a result of the catastrophe, 179 Finns deceased or disappeared. In the beginning of 2005, the Council of State appointed an Investigation Commission to investigate the origin and the consequences of the catastrophe. The investigation of the catastrophe proceeds in conformity with the provisions of the Accident Investigation Act and the Accident Investigation Decree. The Investigation Commission works within the Accident Investigation Board, following its operating methods.

In 2004, a monitoring of the implementation of the recommendations in the investigations reports on "other accidents" was commenced. In the monitoring, the Accident Investigation Board sends a reasonable number of recommendations to the implementing parties. The addressees are requested to specify the measures adopted or intended to be adopted in the future in view of the implementation of the recommendations. The monitoring was commenced as concerning the recommendations issued in 2000.

Investigations commenced in 2004

Identifier	Date	Title of the investigation
A 1/2004 Y	19.3.2004	A full trailer truck colliding with a coach on the main road 4 in Konginkangas, Äänekoski
A 2/2004 Y	26.12.2004	Catastrophe in Asia
B 1/2004 Y	1.2.2004	Collapse of the roof of a maintenance building built by voluntary workers at a slalom centre in the municipality of Pohja
B 2/2004 Y	22.12.2004	A coach swerving off the road ending up into a stream in Halikko

Investigations completed in 2004

Identifier	Date	Title of the investigation
B 1/2003 Y	17.1.2003	Roof of multi-purpose hall collapsing at Mustasaari
B 2/2003 Y	1.2.2003	Fair center roof collapsing in Jyväskylä
B 3/2003 Y	25.8.2003	Fall of an intermediate floor structure intended as permanent at a service station site in Orivesi
B 4/2003 Y	4.9.2003	Dropped ceiling of indoor spa resort collapsing in Kuopio
B 1/2004 Y	1.2.2004	Collapse of the roof of a maintenance building built by voluntary workers at a slalom centre in the municipality of Pohja
D 1/2003 Y	20.4. – 20.5.2003	School building in residential use catches fire in Jyväskylä rural municipality and five other fires (safety study, S)



B 1/2003 Y

Roof of multi-purpose hall collapsing at Mustasaari on 17 January, 2003

On January 17, 2003, at 16.51 hrs, an incident took place in Mustasaari municipality where the roof of a multi-purpose hall – designed among other things, for sports activities – collapsed above the spectator stand, over an area of more than 150 square meters.

At the time of the incident, there were football practices going on and individual sportsmen practising on the running track and elsewhere in the hall. Moreover, there were in the stand some parents of children practising football on the ground. According to the estimates, altogether 130 persons were in the hall when the incident occurred.

First a noise was heard as coming from the roof. It was identified as the noise of snow falling down from the roof. Such falling down of snow in big rafts from the roofs of buildings is a regular yearly phenomenon, and hence the noise was quite familiar. The noise lasted for a few seconds and then a crash was heard and two separate beam lattices of steel in between the girders of the hall, collapsed. At the same time profiled steel sheet, insulation materials, plastic roof coating materials and about two truck-loads of snow penetrated into the hall.

Quite soon an ambulance arrived at the scene of the incident, as well as two rescue units of Mustasaari Rescue Service. Altogether 20 rescue service, ambulance and police units had been called to the scene of the incident. At first uncertainty prevailed as to whether someone had been buried by the collapsed structures and layers of snow. But soon it became evident that no personal injuries had resulted from the incident.

The direct cause of the collapsing of the roof was that the fastening brackets of the beam lattices mounted between the hall girders detached from their weldings. The fastening brackets used in the collapsed hall differed from the brackets in the earlier hall; in fact they had been designed insufficiently without due consideration of the loads they would have to endure. Actually the strength of the brackets had not been ensured by design calculations in the planning and design phase, and the plans had been checked only by the planner himself. Therefore this design error in the planning of the component detail could freely move on through the entire construction process and finally cause the roof to collapse.

Furthermore, the relevant investigation disclosed shortcomings in the calculations of the loads to be endured by the beam lattices mounted between the girders, in the dimensioning of the structural components connected in the damaged joint, and in the overall bracing of the hall. These secondary shortcomings nevertheless had no direct impact on the collapsing of the roof.

The investigation report is included in the same publication as the investigation report on the collapsing of the roof of an exhibition hall in Jyväskylä, on February 1st, 2003. The corresponding recommendations based on both investigations and drawn up jointly, are included in a separate Recommendations Part of the publication referred to.



B 2/2003 Y

Fair center roof collapsing in Jyväskylä on 1 February, 2003

On Saturday February 1st, 2003, at 9.39 hours, an incident took place in Jyväskylä, Finland, where a Fair Center roof collapsed over an area of about 2,500 m², with the exterior wall also collapsing over a width of about 20 meters. The building was quite new with its B hall of altogether 7,766 m² having only been opened and introduced into service about two weeks earlier.

The previous day, a training and education fair organized in the Fair Center had ended, and on Saturday morning there were 12 Fair Center employees and exhibitors' representatives stripping the stands in the B hall. Suddenly a loud bang was heard from the roof of the hall, and some of the people inside went to see where the noise came from. Then someone discovered that one of the tie beams of the roof truss pair made of laminated timber had broken in its narrow part close to the end of the roof truss. The observers understood that the roof would possibly collapse and they yelled to the others to leave the hall. In an estimated two minutes time, the roof truss pair referred to, as well as the three following roof truss pairs and the roof elements supported by them, collapsed and fell down. All people had managed to leave the hall and no-one was injured.

Already before the collapse, one person in the hall had called the Emergency Exchange. The collapse actually took place during that call, and hence the Emergency Exchange was immediately informed of the incident. Numerous rescue units and ambulances were called out to the scene of the incident. In about half an hour it had been ascertained that there was no-one left buried under the ruins.

The collapsing roof trusses made of laminated timber featured a length of 55 meters which is exceptionally great. The trusses had been mounted in the plant by an interconnection of the laminated timber parts by dowel joints. In the dowel joints two steel plates penetrated the timber and 4 to 48 steel dowels – as depending on the size of the joint - had been installed perpendicularly to them. The truss pair consisted of two identical trusses interconnected in parallel by screws.



Already at the initial phase of the investigation of the incident, it became evident that according to the eye-witnesses, one joint of the truss of the roof truss pair having first collapsed, only had 7 dowels while according to the plans, their number should have been 33. In fact the collapse commenced as caused by this quality control negligence by the truss manufacturer. At the time of the incident the snow load was measured as being about 25% (i.e. 50 kg/m²) of the load having served as the basis in the planning, and only one truss of the truss pair displayed missing dowels. Hence the damage ought to have been limited only to one of the trusses. But a collapse was generated and it proceeded as the major dowel joints yielded in a cleavage fracture, that is, the joint section had torn off the timber along the outer rows of the dowel group. The European planning instructions implemented in the planning of the trusses, fail to consider such a type of breaking, and therefore the strength of the biggest joints only featured about 50% of the planned rates. According to the investigation commission, the errors discovered in the instructions imply deficiencies in the drawing up of the norms, in their adoption and implementation, and in the communication of their detection. Already several years before the incident, the errors had in fact been corrected in a more recent draft of the instructions and the problematic issues had been discussed in a Finnish technical journal. Hence the errors were well known by a limited circle of experts.

Jointly with the investigation commission studying the collapsing of the roof of a multipurpose hall at Mustasaari on January 17, 2003, the investigation commission drew up recommendations that target a prevention of such incidents in the future. The recommendations are presented in a separate part to be published simultaneously with both of the relevant Investigation Reports.

B 1/2003 Y and B 2/2003 Y Recommendations

The safety recommendations are drawn up on the basis of the investigations on the building incidents on January 17, 2003 at Mustasaari, Finland, and on February 1, 2003 in Jyväskylä, Finland. The relevant Investigation Reports B 1/2003Y and B 2/2003Y have already been published. The corresponding safety recommendations envisioning a prevention of similar incidents are elaborated jointly by the Accident Investigation Commissions.

At Mustasaari on January 17, 2003, an incident occurred where the roof of a multipurpose hall, designed e.g. for sports activities, collapsed above the spectator stand over an area of about 150m². About two weeks later, another building incident took place where the roof of a recently built fair center collapsed over an area of about 2500m². This incident occurred on February 1, 2003 in Jyväskylä. The incidents generated no personal injury.

The incidents referred to reveal inadequacies and deficiencies in the mutual cooperation within the construction organization. Therefore the Investigation Commissions recommend that the organizations active in the building business develop such methods that ensure an adequate cooperation among the different parties engaged in a building project. Both of the incidents discussed display failing joints of the support constructions, and hence the Investigation Commissions recommend that such methods ought to be designed and developed for the construction business that enable an identification of any safety critical details in a building project. In addition, the instructions for the prevention of a progressive collapse should be harmonized so as to enable the

same instructions to be applicable to all building materials. This recommendation is based on the collapse of the Fair Center roof in Jyväskylä.

Furthermore, the Investigation Commissions recommend that the building inspection authorities and the labour protection authorities work in close cooperation, which was not the case in the construction of either one of the halls discussed. The Investigation Commissions believe that building incidents could also be prevented by the creation of a database with information on incidents and hazardous situations in the building business – that is, by learning from errors.

To secure an appropriate quality standard of European planning and design instructions, it is recommended that a corresponding drawing up and maintenance system be generated so as to permit a rapid response to any safety critical error or shortcoming.



B 3/2003 Y

Fall of an intermediate floor structure intended as permanent at a service station site in Orivesi on 25 August, 2003

An old service station building in Orivesi was being extended. The steelwork of the extension had been installed, and hollow-core concrete slabs had been lifted onto it as an intermediate floor structure - i.e., the floor of the second storey. On the morning of Monday, 25 August 2003, a six-centimetre-thick surface concreting was performed onto the area of the hollow-core slabs. At approximately 11:30 a.m., the workers had begun returning from their lunch break and went to work under the area of the hollow-core slabs. Suddenly, the area of the hollow-core slabs, approximately 200 square metres of surface area, fell while five men were in the danger zone. Three of the men managed to move away, but two remained under the fallen slabs. One man was seriously injured. Another died, despite the efforts of rescue workers, who arrived fairly quickly at the scene.

The steelwork had been manufactured in a small machine shop, transported to the site, and assembled and installed there. The hollow-core slab section with its horizontal steel beams fell when three of the six consoles supporting the horizontal beams and hollow-core slabs came off the pillars. The consoles had been fixed to the pillars with fillet welds, but these failed completely. The welds hardly penetrated the pillar, and the load borne by each joint was only a fraction of its design capacity. Apparently, the technical reason was that the welding voltage used had been slightly too high and the welding torch had been held in a slightly incorrect position.

The error was possible because the procedures for establishing the compliance of the construction products, listed in the construction orders and standards, had not been followed. The supplier of the steel structures was permitted to manufacture and install the structures without proving their compliance. A welding procedure specification (WPS), a valid certificate of the welder's qualification - applicable to the welding job in question - and a welding record concerning the manufacture would have served as proof according to the standards. Neither did the monitoring by the authorities ascertain that the compliance of the load-bearing structural parts and of the construction products used in them had been established before the installation.

To avoid similar accidents, the investigation commission recommends that the organisations in the of steel construction branch establish procedures for determining and proving the compliance of welded steel structures in order to aid in the supervision of construction and assist the construction organisation and the manufacturers of structures.

Furthermore, the investigation commission recommends that the construction supervision authority remind the developer during the early stages of a project of his duty of solicitude and of methods of establishing the compliance of products supplied by contractors and subcontractors. In this way, developers would be better prepared to monitor the capability of the construction organisation formed by them to produce structures in compliance with the standards.

In the welding tests performed during the inquiry, it was noted that one proof of a good welded joint is a bright streak left on the edge of the weld. This observation should be studied in more depth, and - as applicable - the subject should be added to the instructions for visual inspection of welded joints.



B 4/2003 Y

Dropped ceiling of indoor spa resort collapsing in Kuopio on 4 September, 2003

On Thursday morning September 4, 2003, the dropped ceiling above the main pool in the new pool compartment of Rauhalampi spa-resort hotel in Kuopio, Finland, collapsed in its entirety. At the time of the incident, there were three persons swimming in the pool. At 8.52.48 hours the swimmers perceived that the ceiling was falling down. In two seconds the dropped ceiling had collapsed in the water slide end of the pool, and in three seconds the entire dropped ceiling had fallen down. The swimmers failed to escape from the blow of the collapsed ceiling, but they were located in a way that they managed to avoid losing consciousness by the blow. In fact they man-

aged themselves move over towards the edge of the pool, and two of them were able to get out of the water themselves while after over eight minutes in the pool under the collapsed ceiling, the third person was helped out by the spa staff.

The swimmers were lucky only to suffer some minor injuries. The entire area of the dropped ceiling measuring 256 m² and covering the main pool, as well as its lighting fixtures, fire detector facilities and wiring system had to be rebuilt. When collapsing the ceiling broke a surveillance camera, pool equipment and fittings. The direct costs of the incident amounted to about €75,000 and the sales return losses suffered by the spa-resort hotel were estimated to about €111,000. The new pool compartment had to be closed over a period of almost six weeks.

The collapse of the dropped ceiling was caused by a breaking of the suspension wires made of stainless steel, as a result of stress corrosion. Some wires close to one another having broken, the stress in the adjacent wires grew to the extent that other wires that had weakened by the stress corrosion, broke and spring suspensions came loose from the supporting long beams. As wire material, AISI 304 stainless steel had been selected, as at the time of the realization of the project, the designers, planners, constructors and building supervision authorities had no knowledge of the SFS-ENV 1993-1-4 Eurocode preliminary standard with its national implementation instructions, and they were hence unable to use it in the selection of an appropriate steel quality for indoor swimming-pool and spa conditions. According to an investigation conducted by the Technical Research Centre of Finland (VTT), the AISI 316 acid resistant steel specified in the original plans would not have been a significantly better solution as regards stress corrosion. Stress corrosion is not only conditioned by stresses caused by load, but a more important conditioning factor is to be seen in the residual stresses generated by wire treatment. In practice residual stresses can hardly be avoided as they are generated even in the installation phase.

The complete collapse of the dropped ceiling was a result of the ceiling having been built as entirely integral without any expansion joints or special joints that would have prevented a progression of the collapse. Moreover, the ceiling was relatively heavy as one suspension wire was stressed by an about 33 kg load. The bearing rate of the spring suspension was 25 kg with the maximum admissible load being defined as 328 N (33.4 kg). A dropped ceiling is not considered as a support construction, and consequently, a progressive collapse had not been considered in the relevant plans.

The ceiling having been built, the condition of its suspension and supporting structures had not been inspected, as the dropped ceiling featured no inspection hatches and its height from the upper level of the pool was over five meters.

To prevent corresponding collapses of dropped ceilings, the Accident Investigation Board of Finland recommends that the regulations and instructions pertaining to planning and design should include detailed specifications for such important load support construction materials that are appropriate for indoor swimming-pool and spa conditions, in terms of safety. Moreover, the instructions concerning dropped ceiling structures of indoor spa resorts and swimming pools ought to be updated so as to consider dropped ceilings as support constructions and to realize the air-conditioning of the space above the dropped ceiling in a way rendering impossible any chlorine penetration or accumulation on the surfaces of non-corrosion-resistant structures.

The summary, introduction and the legends for the figures and tables in the report are also in English.



B 1/2004 Y

Collapse of the roof of a maintenance building built by voluntary workers at a slalom centre in the municipality of Pohja on 1 February, 2004

Early in the morning of Sunday 1 February 2004, approximately 250 m² of a maintenance building of 720 m² collapsed at a slalom centre in the Municipality of Pohja. The building housed a cafeteria, ski hire business, machinery shelter and an open space for victory ceremonies, karaoke events etc. and functioning as a lounge. At the time of the accident, the slalom centre was closed, although staff engaged in preparations for the day's competition had already arrived. However, no one was injured and there was only slight material damage.

Inside the building, a staff member noticed a board hanging from the ceiling, which had bowed, and some exposed insulation, while it was evident from outside that the roof's ridge was slightly bowed in the middle. The fire brigade was called out, bringing two vehicles with elevating platforms with the intention of clearing the snow from the building. Unfortunately, they were too late to prevent four of its nine steel trusses from buckling and the consequent collapse of the roof.

The technical cause of the accident was a flexural moment, significantly higher than the capacity of the rafters and which was exerted on the rafters near the ridge. This could have been avoided by designing the truss diagonals to extend all the way up to the ridge, whereas in the actual truss, the diagonals extended along the rafters, but stopped 1.5 metres short of the ridge. The trusses were therefore poorly dimensioned, and the flexural moment and other force values for the rafters incorrectly calculated.

The slalom centre is owned by a local sports club, and the maintenance building was designed and built by voluntary workers in 1993 and 1994. In the opinion of the Board of Inquiry, the structural deficiencies were caused by the construction organisation's lack of experience.

The prerequisites for safe construction are thoroughly specified as part of the construction standards currently in force. However, in order to avoid similar accidents, the Board of Inquiry suggests that building officials and those within municipalities granting subsidies should actively ensure the employment of safe building methods in buildings built by voluntary workers for public

use. In this respect, the municipalities have an excellent opportunity to improve safety, since they are aware of such projects and are often financing them.

For existing buildings of this type, the Board of Inquiry recommends that municipalities, local building officials and building owners establish whether buildings exist within their areas whose structural safety should be examined. If their structural safety cannot be established based on the designs and other material, additional studies and reinforcement of the structures may be necessary.



D 1/2003 Y (Safety study, S)

School building in residential use catches fire in Jyväskylä rural municipality; five other fires over the period from 20 April to 20 May, 2003

A task force investigated a fire having occurred on April 24, 2003 in Jyväskylä rural municipality and having resulted in three male fatalities, as well as five other fatal fires having taken place over period of one month. The task force furthermore drew up a survey on all fires with fatal outcome in 2003, as based on data received from the rescue authority, the police, and the mass media.

As implied by the information collected by the task force, in 2003 a total of 105 persons died in altogether 95 different fires. Over the ten preceding years, the annual average of fatalities in fires was 87 persons, according to the relevant statistics. In 2003 the most frequent causes of fatal fires included smoking (about 30%), intentional setting on fire (about 15%), carelessness with fire (about 15%), and electrical device (under 15%). In about 25 per cent of the cases, the cause of the fire was unknown. Over 95% of the fires occurred in residential environments.

In buildings about 6000 – 7000 fires are recorded per year of which less than 2% have a fatal outcome. Consequently it is not only the cause of a fire that should be investigated but above all the factors that lead to a fire resulting in fatalities. Actually in almost all cases death was caused by the resident being unable to act as required in a fire situation, or being unable or unwilling to understand what would be the adequate modes of action, and hence failing to escape fast enough from the building. As a rule, the probability of managing to escape and survive showed a deteriorating trend as due to, among other factors, a reduced capability to act accordingly, as caused by alcohol or drug use, physical or mental illness, or advanced age. Furthermore in a fire situation, small children are entirely dependent on the aid of others.



In most fires with fatal outcome, the resident would have needed immediate help by others in order to be rescued. But to deliver and receive help the fire needs to be immediately detected, since if the fire is only discovered from outside the building, it is often too late to manage to get the persons inside out of the building. Nearly all fatal fires in 2003 were discovered too late to enable the fire brigade to save the persons inside.

The task force confirms that the relative number of fire fatalities in Finland is remarkably high as compared with the corresponding figures in the other Western European countries, and that no signs of improvement of the situation are discernible. On the contrary as the baby boomers grow older fire fatalities are expected to increase. As the present state of affairs cannot be accepted, the following principle targeting a more positive development in the future should be generally adopted by society (in parallel with corresponding traffic safety targets): the housing conditions of people should be such as preventing any fatality or serious injury in the event of a fire.

The task force proposes that in the future all fatal fires be thoroughly investigated. Moreover, the task force recommends that in connection with their decision-making on housing issues, the municipalities, organisations supplying housing services, relevant associations and foundations take into consideration fire risks and assess the fire safety standard to be adopted. In terms of practical measures to improve fire safety, the task force suggests that special campaigns be arranged to promote safe smoking habits and that subsidies be allocated to improve fire safety in residences and specifically to equip the residences with automatic fire extinguishing systems (sprinklers).

Recommendations

The investigation reports on "other accidents" completed in 2004, yielded a total of 18 recommendations. Twelve recommendations were addressed to the construction industries, while five recommendations have been drawn up on the basis of the safety study on fatal fire accidents and hence concern the fire safety sector.

Other accident investigations in 2000–2004

Serious accidents

The Council of State appoints an Investigation Commission for serious accidents and catastrophes.

Identifier	Title of the investigation	Published
A 2/2004 Y	Catastrophe in Asia on 26 December, 2004	-
A 1/2004 Y	A full trailer truck colliding with a coach on the main road 4 in Konginkangas, Äänekoski on 19 March, 2004	-

Accidents and serious incidents

An Investigation Commission is appointed by the Accident Investigation Board.

Identifier	Title of the investigation	Published
B 2/2004 Y	A coach swerving off the road ending up into a stream in Halikko on 22 December, 2004	-
B 1/2004 Y	Collapse of the roof of a maintenance building built by voluntary workers at a slalom centre in the municipality of Pohja on 1 February, 2004	2004
B 5/2003 Y	An explosive fire in steel mill in Tornio on 19 September, 2003	-
B 4/2003 Y	Dropped ceiling of indoor spa resort collapsing in Kuopio on 4 September, 2003	2004
B 3/2003 Y	Fall of an intermediate floor structure intended as permanent at a service station site in Orivesi on 25 August, 2003	2004
B 2/2003 Y	Fair center roof collapsing in Jyväskylä 1 February, 2003	2004
B 1/2003 Y	Roof of multi-purpose hall collapsing at Mustasaari on 17 January, 2003	2004
B 1/2002 Y	Acrylonitrile storage tank exploding and catching fire at Kaipainen, Anjalankoski on 13 September, 2002	2003
B 2/2001 Y	Phenol leakage in the Port of Hamina on 12 June, 2001	2002
B 1/2001 Y	Ceiling of a market falling down in Jyväskylä on 26 April, 2001	2001
B 2/2000 Y	Collapsing of ceiling of supermarket at Pudasjärvi on 27 December, 2000	2001
B 1/2000 Y	Breaking of laminated beam in roof of indoor swimming pool centre at Iisalmi on 29 March, 2000	2000

Safety studies (S)

In case an accident or incident does not call for an investigation as such, but when similar accidents or incidents occur repeatedly, the Accident Investigation Board may set up a team to investigate the safety risks involved.

Identifier	Title of the investigation	Published
D 1/2003 Y	School building in residential use catches fire in Jyväskylä rural municipality and five other fires 20.4. – 20.5.2003	2004
D 1/2001 Y	Bus fires in Finland during 2001	2002
D 1/2000 Y	Bus fires in Finland during 2000	2001



FINANCES

The allocations granted for the operation of the Accident Investigation Board and its investigation of accidents and incidents are included in the state budget under its main division of the Ministry of Justice. The allocations intended to cover the costs generated by the investigation activities are included under the sub-item "Special expenditure" which is an appropriation estimate. These sums are included in the "Investigation allocation" column in the table below.

Expenditure of the Accident Investigation Board and its accident investigation activities in 2000-2004 (financial statement data). The FIM figures of 2000 have been converted to euro figures.

Year	Accident investigation board	Investigation allocation	Total
2000	698 715 euros	806 068 euros	1 504 783 euros
2001	759 422 euros	867 830 euros	1 627 252 euros
2002	780 007 euros	826 375 euros	1 606 382 euros
2003	792 448 euros	1 270 330 euros	2 062 778 euros
2004	831 798 euros	1 250 585 euros	2 082 383 euros

Allocations of Accident investigation board in 2004	
Salaries	576 599 euros
Rents	91 666 euros
Other expenses	163 533 euros
Total	831 798 euros