



**Accident Investigation Board of Finland  
Annual Report 2005**





## 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 1<sup>st</sup>, 2004). As for maritime accidents, their investigation is based on the recommendations 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](http://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 M refers to the first serious marine accident investigation in 2004.



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## REVIEW 2005

Both of the serious accident investigations commenced in 2004 were brought to completion in 2005. The investigation report concerning the South-East Asian natural disaster of Boxing Day 2004 was completed in June and the investigation report concerning the collision of a vehicle combination and a charter coach at Konginkangas on 19 March 2004 was completed in October. Although the natural catastrophe in South-East Asia differed in many respects from any past accidents involving Finnish nationals, it was also investigated by a government appointed investigation commission in accordance with the Investigation of Accidents Act 373/85. The authoritative commission chaired by President Martti Ahtisaari and vice-chaired by Councillor of State Harri Holkeri completed its work within an exceptionally short timeframe, in less than six months. The commission was not, however, required to investigate the causes of the natural disaster like Konginkangas commission investigated by means of e.g. test drives and detailed simulations.

Several safety recommendations were given in the investigation reports for both serious accidents. The recommendations were mainly issued to the competent authorities in question. Implementation of the said safety recommendations is well underway. The publication of both investigation reports received considerable media attention.

Three of the year's five ongoing serious incident investigations were completed in 2005. These concerned the coach accident in Halikko in December 2004, the supermarket ceiling collapse in Sysmä in April 2005 and the explosive fire at the steelworks in Tornio in September 2003. Clarification of the immediate cause of the explosive fire in Tornio proved especially difficult. The supermarket ceiling collapse in Sysmä was predominantly caused by the same factors as the supermarket ceiling collapse in Pudasjärvi in 2000. This highlights the need for improvements in communicating the results of investigations, the flow of information and the repair of critical details.

In 2005 only 25 accident investigations were completed, i.e. less than half of the 55 accident investigations completed in total in 2004. Four rail traffic accident investigations and six marine accident investigations were completed, as compared to the years 2003 and 2004 in which some thirty marine accident investigations were completed each year. During these two years, the number of marine accident investigations remaining uncompleted was effectively reduced, but resources were insufficient for the investigation of all marine accidents which occurred in 2004 and 2005 alongside ongoing investigations. A comprehensive report on the grounding of ms ISABELLA in the Åland Islands in December 2001 was, however, completed. In aviation, 11 category B and C investigations plus 21 preliminary (category D) investigations were completed.

In 2005, 34 accident investigations and 22 preliminary aviation investigations were commenced as compared to 43 investigations commenced during the previous year. In 2005 the number of aviation and rail incidents qualifying for investigation remained approximately the same as during

the previous year, while marine transport proved exceptionally uneventful with the total number of incidents submitted for investigation falling to just eight, i.e. below half that of 2004.

2005 was a bleak year in terms of aviation safety. The helicopter accident which occurred off the coast of Tallinn on 10<sup>th</sup> August was Finland's first fatal accident involving a transport category aircraft since 1963. Investigation of the accident has been carried out in compliance with the Convention on International Civil Aviation and, in view of this, the Accident Investigation Board of Finland appointed a team of experts to operate under the supervision of the accredited representative of the Estonia led investigation commission.

Four safety studies were in progress in 2005. The investigations concerned level-crossing accidents, the effect of navigation bridge crew fatigue on marine accidents, seasonal marine vessel accidents and accidents during piloting. Safety studies are an effective means of simultaneously investigating a number of accidents of the same type and provide a broader basis for safety recommendations than individual accident investigations.

The total accident investigation cost in 2005 remained at approximately the same level as in 2003 and 2004, but the costs per commenced and completed investigation rose considerably. Costs did not fall in line with the number of commenced and completed accident investigations because a large number of accident investigations requiring considerable resources were completed in 2005.

The activities of the EU's aviation, rail and marine safety authorities expanded significantly in 2005. All three safety authorities have energetically undertaken to develop and harmonise the accident investigation of their own modes of transport within Europe. The Accident Investigation Board of Finland has actively participated in this development. The operating principles and procedures of the Accident Investigation Board of Finland are proving to correspond effectively with the objectives set by the EU authorities.

In addition to regular Accident Investigation Board employees, investigation commissions employed a total of 94 outside experts in 2005, each of which has continued to deliver an excellent standard of investigative work. This was reflected in the 2005 investigation report readership survey, in which more than 90 percent of respondents considered the investigation reports to be of high quality and professionally conducted. Many thanks to all accident investigation participants for their excellent and vital contributions towards improving public safety.



Tuomo Karppinen  
Director





### Summary of investigations commenced in 2005

Commenced						
	A	B	C	D	S	TOTAL
Aviation	-	6	7	22	-	35
Rail	-	1	9	-	1	11
Marine	-	1	7	10	1	19
Other	-	3	-	-	-	3
<b>TOTAL</b>	-	<b>11</b>	<b>23</b>	<b>32</b>	<b>2</b>	<b>68</b>

### Summary of investigations completed in 2005

Completed						
	A	B	C	D	S	TOTAL
Aviation	-	3	8	21	-	32
Rail	-	-	4	-	-	4
Marine	-	2	4	7	-	13
Other	2	3	-	-	-	5
<b>TOTAL</b>	<b>2</b>	<b>8</b>	<b>15</b>	<b>28</b>	<b>-</b>	<b>53</b>

## Investigation commissions

The Accident Investigation Commissions had the following memberships in 2005.

### Aviation

Ismo Aaltonen, Pekka Alaraudanjoki, Ari Anttila, Markus Bergman, Jussi Haila, Juhani Hipeli, Ari Huhtala, Jari Huhtala, Arja Holopainen, Heikki Isomaa, Antti Kaarnamo, Erkki Kantola, Pekka Kuoppala, Seppo Laine, Martti Lantela, Timo Lindholm, Esko Lähteenmäki, Hannu Melaranta, Juhani Mäkelä, Toni Mäkelä, Hannu Mäkeläinen, Vesa Palm, Timo Poikonen, Kari Siitonen, Esko Tilli, Tapio Tourula, Hannu Vartiainen and Tapani Vääntinen.

### Rail

Veikko Alaviuhkola, Aki Grönblom, Kati Hernetkoski, Veli-Jussi Kangasmaa, Timo Kivelä, Jukka Koponen, Sirkku Laapotti, Pertti Mikkonen, Reijo Mynttinen, Hannu Räisänen, Esko Väärttiö and Kari Ylönen.

### Marine

Markku Haranne, Martti Heikkilä, Olavi Huuska, Sakari Häyrinen, Mikko Kallas, Tuomo Karppinen, Jussi Keveri, Kari Larjo, Kari Lehtola, Jaakko Lehtosalo, Petteri Leppänen, Karl Loveson, Petri Luotio, Seppo Männikkö, Ari Nieminen, Veli-Pekka Nurmi, Risto Repo, Klaus Salkola, Tapani Salmenhaara, Heikki Seppänen, Pertti Siivonen, Juha Sjölund, Sanna Sonninen, Matti Sorsa, Pirjo Valkama-Joutsen, Kai Valonen and Micael Vuorio.

### Other

Martti Ahtisaari, Hannu Alén, Maaret Castrén, Markku Haikonen, Merja Hallantie, Pekka Heikkinen, Risto Hellgren, Harri Holkeri, Seppo Huovinen, Jari Hämäläinen, Ville Hämäläinen, Kimmo Kahma, Tuomo Karppinen, Esko Kaukonen, Ullamaija Kivikuru, Ilkka Kiviranta, Kurt Kokko, Jouko Koskimies, Juha Kurenmaa, Antti Kärki, Risto Lautkaski, Kari Lehtola, Matti V. Leskelä, Timo Lindqvist, Harriet Lonka, Jorma Lähetkangas, Esko Lähteenmäki, Reijo Mynttinen, Tapani Mäki-kyrö, Matti Olsson, Pär Stenbäck, Anssi Parviainen, Unto Pentinmäki, Klaus Rahka, Veikko Stolt, Seppo Suuriniemi, Ari Vakkilainen, Esa Vainio, Pirjo Valkama-Joutsen, Kai Valonen, Esko Väärttiö and Kari Ylönen.



## PERFORMANCE

In the following, the activities of the Accident Investigation Board in 2005 are discussed in terms of the targets set by the Ministry of Justice.

*Serious incident or accident investigations (category B) must be completed within one year. Incident or minor accident investigations (category C) must be completed within six months.*

Three category B and eight category C aviation accident investigations were completed. The average investigation time needed for category B investigations was 13 months, with 9 months needed for category C investigations. One category B investigation lasted 21 months because additional flight tests had to be performed in the summer of 2004 in order to clarify the findings of the initial tests carried out in 2003. All but two category C investigations were completed in around six months.

The average investigation time of the four published category C rail investigations was 11 months.

Two category B marine accident investigations and four category C marine accident investigations were completed, one of which was a joint Finnish-Swedish investigation. An extensive category B investigation dealt with the grounding of ms ISABELLA on 20th December 2001. One category C investigation concerned an accident which occurred in 2001. A joint investigation concerning six pleasure boat accidents lasted a little under two years, calculated from the date of the first accident. Three marine accident investigations concerning accidents which had occurred in 2004 were completed, the investigation time of each being around one year.

A total of five investigations of "other" incidents, i.e. non-aviation, rail or marine investigations, were completed. Their average investigation time was around 12 months. At close to 20 months in duration, the longest investigation was that of the explosive fire at the steelworks in Tornio. The investigation of the South-West Asian natural disaster was completed in under six months.

*Assessment of the effect of EU regulations on the activities of the Accident Investigation Board of Finland.*

An excellent summary of the procedures applicable in the investigation of marine accidents within the sphere of the EU was presented at the international seminars held by the European Maritime Safety Agency (EMSA) in February and November, at which different countries demonstrated their own investigation systems and EMSA presented its plans for a joint EU investigation and reporting system. The planned system takes into consideration the accident investigation related development work of the International Maritime Organization (IMO), in which the Accident Investigation Board of Finland's Chief Marine Accident Investigator is also closely involved. The same issue was addressed at the first joint meeting of European marine accident investigators held in Helsinki.

The rail accident investigation methods applicable in Europe and the demands set by the new rail safety directive were discussed at two meetings held in October by the EU's European Railway Agency (ERA). These issues were also discussed at the first meeting of the European railway accident investigators held in Amsterdam in June and at the meeting of Nordic rail accident investigators held in Finland in November.

The Accident Investigation Board's Aviation Investigator also actively participated in the meetings of European and Nordic aviation accident investigators and in seminars held by the European Aviation Safety Agency (EASA).

In connection with the annual updating of operating manuals, their content regarding EU accident investigation requirements was also verified.

*Development of the Accident Investigation Board's Quality System underway.*

Information was gathered on quality systems and ISO 9000 standards. One aviation accident investigation and one marine accident investigation were audited. In the audits, the congruity of investigation procedures with operating manuals was analysed and quality development needs were evaluated. Furthermore, the quality of investigation reports and investigation development needs were assessed by means of a comprehensive questionnaire survey. Some 1,600 questionnaires were sent to the readers of the investigation reports in all four sectors of investigation. Around 500 responses were received in total. A quality system was outlined and a development project designed on the basis of the survey data and other gathered information. The results of the study indicate that no accident investigation boards have yet adopted an accredited quality system for any of their activities, although at least the ICAO has begun auditing its aviation accident investigations.

*Updating and routinising of recommendation implementation monitoring.*

Monitoring of the implementation of rail and aviation safety recommendations has been continued in observance of monitoring procedures which have become established as routine practice. Recommendation implementation monitoring has also been incorporated into the accident investigations of the "other accidents" category and will be continued until all monitoring is fully up to date. The monitoring of marine accident investigations has commenced and observes the same procedure as the aviation and "other accidents" categories. Around 60% of all recommendations issued in rail and aviation investigation reports were implemented. The status regarding the level of implementation of the majority of recommendations is known. Around half of all recommendations issued since the year 2000 within the "other accidents" category have been analysed to date.

*Focus on competitive tendering and cost monitoring.*

Chief investigators have monitored the costs of accident investigations carried out in their own sectors in accordance with the guidelines drawn up in 2004. In 2005, the cost of English and Swedish language translation and printing of investigation reports, which together represent a significant and recurrent proportion of overall investigation costs, were compared and clarified. A separate study aims to expand the Accident Investigation Board of Finland's current sphere of partner research institutions by investigating the services offered by different universities and polytechnics throughout Finland. To this end, the Accident Investigation Board also aims, wher-



ever possible, to purchase the services of new institutions with which it has no previous partnership history.

*Accident Investigation Board to introduce Tarmo working time monitoring system in 2005.*

At the end of 2005 the Accident Investigation Board was ready to commission its new Tarmo working time monitoring system at the beginning of 2006.





## AVIATION

In terms of air safety, the year 2005 was overshadowed by the tragic passenger helicopter accident off the coast of Tallinn on the 10<sup>th</sup> August, in which all 14 passengers and crew on board were killed. The accident is under investigation by the Aircraft Accident Investigation Authority of Estonia, as the site of the accident is located within Estonian territorial waters. The Accident Investigation Board of Finland accredited representative and advisors to participate the investigation and to assist the Estonian investigation commission. The Finnish investigative team was appointed in observance of the convention on International Civil Aviation Organization (ICAO) and Annex 13 thereof. The accident was Finland's first fatal accident involving a transport category aircraft since 1963.

General aviation accidents and serious incidents were investigated by a total of 13 investigation commissions. Of the cases investigated, one involved a forced landing and in two cases one person suffered serious injury. One ultralight aircraft accident occurred, in which one person was seriously injured. No glider accidents occurred in 2005.

In addition to the abovementioned accidents, 6 general aviation and 7 glider incidents resulting in material damage were also recorded. 11 incidents of in-flight damage of ultralight aircraft occurred, one of which resulted in a forced landing. A further three forced landings of ultralight aircraft were successfully executed.

In 2005 a total of 11 category B and C investigations were brought to a conclusion. 22 investigations were commenced using the preliminary investigation/category D investigation procedure, of which 21 were completed in 2005.

A meeting of Nordic aviation accident investigators was held in Canada in September, at which two investigators from Finland participated.

Investigators participated in several training meetings and international meetings and seminars during the year. These included a safety investigation training session arranged by the Finnish Air Force at Pirkkala and a training event held in Stockholm, the theme of which was human factors as the cause of accidents. One investigator also participated in a training event arranged in Prague, the subject of which was the investigation of air traffic control related accidents. Furthermore, one investigator participated in a seminar arranged by the European Aviation Safety Agency (EASA), the subject of which was cooperation between European aviation accident investigation authorities. Multinational aviation accident investigation was once again rehearsed as part of an accident investigation exercise organized by the Group of Experts on Accident Investigation (ACC) of the European Civil Aviation Conference (ECAC).

Investigators gave lectures during the year at 12 training meetings of Finnish authorities and at 10 aviation safety training events held for aviators.

### Investigations commenced in 2005

In 2005 the Accident Investigation Board commenced altogether 13 aviation accident and incident investigations.

Identifier	Date	Title of the investigation
B 1/2005 L	4.1.2005	Serious incident in Kittilä (Tupolev 154)
B 2/2005 L	31.1.2005	Aircraft accident in Helsinki-Vantaa airport (SE-KYH, Cessna 208B)
B 3/2005 L	24.7.2005	Aircraft accident in Jämijärvi (OH-SDV, M.S. 893A)
B 4/2005 L	10.8.2005	Helicopter accident in Tallinn (OH-HCI, Sikorsky S-76C)
B 5/2005 L	2.9.2005	Helicopter accident in Paltamo (OH-HLP, Bell 206B)
B 6/2005 L	17.12.2005	Incident in Kuopio airport (SAAB 2000 and ATR 72)
C 1/2005 L	6.1.2005	Ultralight accident in Vammala (OH-U134, Hybred R 503)
C 2/2005 L	28.6.2005	Aircraft accident Sodankylä (OH-CDO, Cessna 185E)
C 3/2005 L	14.7.2005	Incident in Helsinki-Vantaa airport (RG 1, Redigo and SAAB 2000)
C 4/2005 L	19.8.2005	Helicopter accident in Hailuoto (OH-HME, R22 Beta)
C 5/2005 L	15.8.2005	In-flight fuel leakage (OH-LGF, MD-11)
C 6/2005 L	21.9.2005	Helicopter accident in Sodankylä (OH-HAY, Hughes 269C)
C 7/2005 L	14.12.2005	Incident leading to fall of the passenger stair in Rovaniemi airport (G-OOAB, Airbus A321)

### Investigations completed in 2005

In 2005 the Accident Investigation Board completed altogether 11 aviation accident and incident investigations.

Identifier	Date	Title of the investigation
B 2/2003 L	25.6.2003	Aircraft accident in Enontekiö on June 25, 2003 (OH-CVT, Cessna 185F) ( <i>Published also in English</i> )
B 2/2004 L	16.6.2004	Aviation accident in Pieksamäki (OH-CFG, Cessna A188)
B 4/2004 L	19.9.2004	Aviation accident in Äkäslompolo, Kolari (OH-AKF, Lake LA-4-200)
C 2/2004 L	1.3.2004	Serious electrical power supply failure at Pori terminal area (OH-FAE, SAAB SF340A)
C 3/2004 L	23.2.2004	Near collision with the 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 ATC separation west of Helsinki-Vantaa airport (OH-SAN, Avro 146 RJ and OH-KRH, ATR-72)
C 6/2004 L	5.10.2004	Helicopter accident in Pirunpäävaara, Inari (OH-HAV, Schweizer 269C)
C 7/2004 L	16.10.2004	Helicopter accident in Naruska, Salla (OH-HTE, R 22)
C 8/2004 L	19.11.2004	Four helicopters flying within a danger area in Sodankylä



C 1/2005 L	6.1.2005	Ultra-light aircraft accident at Vammala Ylistenjärvi (OH-U134, Hybred R 503)
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#### **B 2/2003 L**

#### **Aircraft accident in Enontekiö on June 25, 2003**

On 25 June 2003, at 12.30LT there was an accident at Lake Ounasjärvi, Hetta, Enontekiö. A float-equipped Cessna A185F aircraft, owned by Polar Lento Ltd and registered OH-CVT, collided with water during take off. The aircraft was carrying a pilot and two passengers. The pilot and the passenger in the middle row survived with minor injuries but the passenger in the front right seat drowned. The purpose of the flight was a reindeer industry flight. The pilot intended to take the passengers from Lake Ounasjärvi to Lake Kalkujärvi, approximately 40 km northeast.

30 June 2003, The Accident Investigation Board Finland appointed an investigation commission B 2/2003 L. The investigator-in-charge was chief air accident investigator Esko Lähteenmäki and members were MSc Ville Hämäläinen and airline pilot Timo Wahe. The commission nominated professor emeritus Seppo Laine and meteorologist Tapio Tourula as experts to the investigation.

The pilot started the take off towards east along the lake. The head wind was approximately three knots. The waves were approximately 10 cm high. The pilot had trimmed the longitudinal trim in such way that the aircraft lifted off by itself from the float step and continued to climb. As the aircraft was climbing at a height of approximately 15 m, it suddenly rolled and yawed to the right. The pilot used full opposite aileron and full left rudder. The counter control measures were ineffective and the aircraft collided with water at an almost right angle. The aircraft nose had yawed more than 90° to the right. The aircraft capsized but remained afloat. The passenger on the middle row right-hand seat escaped onto the float. The pilot tried to unbuckle the seatbelt of the passenger next to him but was unable to locate the buckle. Finally he had to dive to the surface. The rescuers were able to get the passenger up from the aircraft two hours after the accident.

The investigators investigated the take off procedure used and the effect of the installed Robertson STOL (R/STOL) kit on the take off performance of the aircraft. In the R/STOL kit the aileron mechanism is mechanically connected to the trailing edge flap mechanism and the ailerons, for example, turn 13° down with a flap setting of 20°. The properties of the wing and aircraft were studied with aerodynamic aerofoil and flight mechanics calculations as well as with test flights. The test flight was flown with a flow indicator wool strings attached to the aircraft fuselage, vertical stabiliser, rudder and upper right wing surface. The movements of the strings were video-

taped. The test flight was flown with the same type of aircraft as the accident aircraft with a similar modification and equipment status.

The investigation commission stated that the cause of the accident was the pilot's procedure to climb above the ground effect without reducing the pitch angle. The aileron and flap connection of the R/STOL kit of the aircraft combined with the aileron type caused the right wing to tip stall in take off configuration. The pilot did not recognise the stall and did not act in the required sense to recover.

The investigation commission recommended that the appropriate authority should take measures to inform pilots as comprehensively as possible about the stall behaviour of the Robertson STOL Cessna 185 aircraft. The aircraft flight manual supplement should also contain a warning of this. The commission also recommended that the Finnish Flight Safety Authority would revise the regulations OPS M3-6 and AIR M11-2 so that all persons on board must always wear a life vest during water operations.



**B 2/2004 L**

**Aviation accident in Pieksämäki on June 16, 2004**

An aircraft accident happened at Naarajärvi of Pieksänmaa on Wednesday, 16 June 2004, about 18.05 Finnish time in which an aircraft OH-CFG of type Cessna A188, operated by Aviation club Joonatan, crashed into ground. The pilot of the plane was seriously injured in the impact. The aircraft was destroyed. Accident Investigation Board Finland set 17.06.2004 by its decision number B 2/2004 L an investigation commission. Investigator Juhani Hipeli was nominated as the investigator-in-charge and aircraft mechanic Hans Tefke as a member of the commission.

When preparing the aircraft for the flight the pilot did not have in his disposal the key for the aircraft doors. He decided to open one door by removing the safety pin like hinge pins of the door lower edge hinges so, that the door was opened from the lower edge. The door closing handle and the padlock were at the upper edge of the door. The intention was to remove the padlock inclusive its mechanisms before the flight, but the tools needed for that were not present at that time. When the pilot had climbed into the cockpit another pilot put from outside the door forward hinge pin partially into place. Initially the pilot only intended to start and test run the engine. After a successful test run the pilot decided to fly the test flight right away. The take-off took place from runway 33 at Pieksämäki airfield. After the initial climb the pilot joined the left downwind leg at an



approximate altitude of 600 ft. At the end of a rather narrow downwind leg he extended the flaps to a position of 10 degrees. Having commenced the turn to the base leg the pilot felt the aircraft jerk after which it strongly rolled to the left and the nose pitched downwards. The plane impacted into a ditched marsh in a steep pitch angle and was destroyed. When the safety belts were broken the pilot was slung out through the windshield and was seriously injured.

Although the aircraft was destroyed in the ground impact, practically all parts could be inspected. Both cockpit doors were locked with padlocks. The forward hinge pin of the left door was partially in place, the aft hinge pin was missing altogether. The control system of the plane was intact and the flaps were 10 degrees extended. The engine ignition cables were in bad condition and one spark plug was not operative. The leakage on one of the engine's cylinders was clearly beyond the maintenance tolerance. The defects have not had noticeable effect on the functioning of the engine. The propeller had been rotating and the engine was probably running at the time of impact. Neither a technical fault, contributing to the accident, nor an indication of malfunction was noticed in the aircraft.

It emerged from the investigation that the pilot set out for the flight unprepared, based on thoughts born during the propagation of the events. The decision was probably influenced both by the time of the early evening and the unstable weather, so that the pressure of the ferry flights, planned for the later evening, caused a feeling of hurry. For this reason the pilot set out for the flight with a plane, to which the door was inadequately fixed. The opinion of the investigation team is that most essential in the pilot's actions regarding the accident was that the monitoring and control of speed failed due to several factors disturbing the pilot's action. Besides hurrying there were among other things the opening of the door, inadequate recent experience on the aircraft type, the narrow landing pattern and the strong cockpit noises. The opening of the door probably distracted the pilot's attention. As a consequence the pilot may have reduced the speed to limit the opening of the door and to shorten the landing pattern to speed up coming into landing. The pilot may have held the door closed with one hand, so that the control of the plane was rendered. The inadequate recent experience and the narrow landing pattern, in which the turn to the base leg must be made steeper than normally, probably rendered holding the attitude and speed of the plane. The strong cockpit noises, typical for the aircraft type, may have given an incorrect impression of the utilized power setting and speed.

The cause of the accident was the reduction of speed, caused by the deficient monitoring and control of speed that led to the loss of control and stall of the aircraft on the base leg of the landing pattern. At the prevailing altitude the pilot could not recover the aircraft from the dive and impact to the ground was inevitable.

The investigation team does not present any safety recommendations.



**B 4/2004 L**

**Aviation accident in Äkäslompolo, Kolari on  
September 19, 2004**

On Sunday, September 19, 2004 at approximately 17:36 hours an aviation accident occurred on lake Äkäslompolojärvi in Kolari in which a Lake LA-4-200 Mod. "Buccaneer"-type amphibian aircraft OH-AKF owned by a private person crashed into lake Äkäslompolojärvi while on a cross-country flight. The aircraft was completely destroyed in the impact and sank to a depth of 10 meters down in a few minutes. The two persons in the aircraft were killed. On September 24, 2004 in its decision B 4/2004 L the Accident Investigation Board Finland appointed an investigation committee with investigator Pekka Alaraudanjoki named as chairman, and investigators Matti Korjula, Sippo Nevalainen and Juhani Mäkelä as members.

The aircraft involved in the accident departed off the Rauhala village side of lake Jerisjärvi, from where the men intended to fly near Rovaniemi to Ylikylä and land on the river Ounasjoki nearby. On the left in the pilot's seat was a person whose license was no longer current and in the neighboring seat, the owner of the plane who was in possession of a current license. The plane was equipped with dual controls. Due to the poor weather they had flown low, at an altitude of approximately 50–100 meters, following the shoreline of the river Äkäsjoki leading south from lake Jerisjärvi. The men's plan was apparently to fly via lake Äkäslompolojärvi, from where they would pass through the ravine between Yllästunturi and Kesäkkintunturi into an area of lower-lying terrain, and from there on to the river Ounasjoki and the final destination, Ylikylä.

The aircraft reached the north shore of lake Äkäslompolojärvi near cruising speed at an altitude of approximately 30 - 50 meters. Close to the shore the upper ear of the left horizontal stabilizer's rear attachment fitting broke completely off as a result of fatigue. Subsequently, the stabilizer twisted downward whereupon the forward attachment ear also broke due to the force of the air stream. The stabilizer remained attached to the airplane only by the lower ear of the rear attachment fitting. As a result of the damage the pilot was unable to control the aircraft and it crashed into the lake, canted to the right. The right wing tip struck the water's surface first, causing the aircraft to be flung to the left, with the left wing and forward fuselage taking the largest force of impact. Both occupants sank along with the plane to a depth of approximately ten meters and perished by drowning.

Subsequent inspections revealed that neither the weather nor the crew had a direct effect on the origin of the accident. The upper ear of the left horizontal stabilizer's attachment fitting had been

subjected over a relatively prolonged period to forces exceeding the material's fatigue tolerance and failure had ensued. In the inspections no indications were found that the attachment ear had been entirely broken for long. When final breakage of the attachment point occurred, the surface area of the horizontal surface remaining intact was small. No indications were found that the damaged surfaces had chafed together. This points to the conclusion that after the final breakage of the attachment ear, the stabilizer, due to the effect of the air stream, also broke loose from the forward ear which had been weakened from prior vibration. The air stream then bent the stabilizer downward, whereupon the elevator trim torque tube twisted off and the structure joining the elevators was torn. At that time the aircraft's vertical control capability was almost completely lost.

The cause of the accident was fatigue breakage of the upper ear of the left horizontal stabilizer's rear attachment fitting which, as it progressed, finally led to breakage of the entire attachment point, whereupon the stabilizer was able to twist downward. At that time control of the aircraft was lost and it crashed into the lake.

On October 7, 2004 the investigating committee informed the Finnish Civil Aviation Administration's Flight Safety Authority of its findings and of the stabilizer attachment ear breakage. Because in following current aircraft maintenance and inspection directives it is nearly impossible to detect an incipient fatigue fracture in an attachment point, the investigating committee recommends that the authorized aviation authority undertake measures to ensure the reliability of stabilizer attachments.



**C 2/2004 L**

**Serious electrical power supply failure at Pori terminal area on March 1, 2004**

An incident occurred at the Pori terminal area on March 1, 2004, at approximately 13.40 UTC, when a twin engine Saab 340, turbine powered and propeller driven aircraft, suffered from serious electrical power supply failure. The aircraft, registration number OH-FAE, was owned by Etelä-Pohjanmaan lentoasemapalvelu Oy and operated by Golden Air Flyg Ab. The Finnish Accident Investigation Board, based on decision number C2/2004L, started an investigation on March 8, 2004. Pekka Kanninen was nominated as chairman and aircraft technician Timo Poikonen as a member of the investigation team.

The electrical power supply failure was caused by a left generator failure during the flight. After the generator had failed, only the left battery powered the left side electrical system. A modifica-



tion, which alerts pilots in case of generator failure and disconnects the failed generator automatically, was not performed. Pilots failed to recognise the first indications of the generator failure, and they did not act according to the Emergency / Abnormal checklist, which led to the incident. Further on, during the flight, the battery power drained out and all left side electric instruments were lost. Due to numerous warnings in the aircraft systems, lost instruments and pressure on the pilots, the first approach and landing were unsuccessful, and the pilots had to perform a go-around. The second attempt was successful and the aircraft landed safely. There were no personal injuries, and there was no damage to the aircraft.

During the investigation it was evident that the generator brushes were worn out before the scheduled overhaul time. The generator manufacturer accomplished material investigations, but they did not find a definite reason for premature brush wear. Pilots did not respond correctly to the generator failure, which led to major problems during the flight and to this incident.

The electric power supply failure was caused by a left generator failure. The following facts contributed to the incident:

Pilots did not respond properly to the generator failure. They did not try to solve the problem by referring to the Emergency / Abnormal checklist at any phase of the flight. Cockpit work was not controlled or coordinated, either.

Modification, which would warn pilots and automatically disconnect the failed generator, was not performed on this aircraft.

## **C 3/2004 L**

### **Near collision with the net barrier at Kauhava airport on February 23, 2004**

On Monday February 23rd 2004 at 09:40 Finnish time an incident occurred at Kauhava airport, in which an Air Force Vinka basic trainer made a landing after a VFR cross country flight over a rising arrester net. The Accident Investigation Board Finland decided March 10th 2004 to commence a civil service investigation to clarify the event. Investigator Tarmo Kulmala was nominated as the chairman of the investigation and major Veli-Matti Ketola as a team member.

The registration mark of the plane was VN-5 and the radio call was M-62. The plane set out from Tampere-Pirkkala in the morning at 08:38. On the flight there was a pilot in command, another pilot and one passenger. At Kauhava the tower controller cleared the plane to the right base leg of runway 35. From there the plane positioned itself to the final as number two after a landing jet trainer. The pilot flew the final approach at low altitude trying to land slightly aft of the threshold to reduce the taxiing distance and the time for occupying the runway. The controller intended to change the runway direction directly when M-62 had landed. For this reason the arrester net in front of runway 35 threshold was to be raised up. However the controller started the raise before M-62 had passed over the net. The pilot noticed the rising net, made an evasive maneuver upwards and landed further away on the runway. The controller made, following the instructions of Air Navigation Services Department, a deviation and occurrence report (PHI) that is intended only for internal use of the department. He did not make a report according to Aviation Regulation



GEN M 1-4 of Flight Safety Authority of the occurrence, in which the safe performing of the flight was impaired. The pilot of the plane reported the occurrence using the Air Force reporting system for performed flights and disturbances. As a consequence of these reporting practices the investigation to clarify the occurrence was commenced first when Accident Investigation Board Finland got information about it from the Air Force Staff during 8th to 10th of March 2004. The delay due to using the PHI report and with the investigation parallel PHI and GEN M 1-4 handlings at the Air Navigation Services Department and the conclusions are included into the investigation.

The investigation ascertained the activities of the control tower in securing the aircraft landing before the change of the runway direction, the characteristics of the traffic, flight operative methods at the airport and the reporting procedures of the pilot and the controller. Actions and conclusions, based on the reports, and the cause of the delay in passing the information to Flight Safety Authority and Accident Investigation Board Finland were also investigated. A shortcoming was noticed in the controllers' working methods on noticing and securing the landing. The occurrence reporting practices were not consistent with the instructions of Flight Safety Authority or Air Navigation Services Department and there were contradictions in the numerous instructions given to the ATS personnel.

The incident occurred due to a too early rising of the arrestor net. That was done without securing the position of the last aircraft to land. Contributing factors were the character of the traffic, a "pressing" intensity in radio traffic, lack of using the capacity of another tower controller and an "anticipation" in changing the runway direction. The delay in commencing the investigation was caused by a reporting practice, inconsistent with the instructions.

Safety recommendations are not presented.



**C 4/2004 L**

**Taxiing incident at Helsinki-Vantaa airport  
on August 18, 2004**

Photo: Finnair Oyj tekniikka

On 18 December 2004, an incident occurred at Helsinki-Vantaa airport when a turbo-propeller aircraft collided its tail with another aircraft. The incident took place during a power push-back procedure, where the aircraft uses its own engines to push out from a parking stand. The other aircraft was parked empty in a stand behind the reversing aircraft. In its decision C 4/2004 L, the Accident Investigation Board Finland decided to conduct an investigation into the incident. Air

Accident Investigator Hannu Melaranta was nominated as an investigator-in charge and Investigator Tapani Vääntinen as a member of the investigation commission.

The reversing aircraft was an ATR 72-201 and the parked aircraft was an MD-82. The ATR was departing to a scheduled flight and the crew intended to perform a power push-back procedure to a position where they would have been able to start normal taxiing. A ramp foreman was standing outside the aircraft and he was in charge of the push-back. He was giving hand signals to the crew in order to guide them in manoeuvring the aircraft (marshalling). The aircraft failed to stop in a correct position and consequently collided with another aircraft behind. Both aircraft sustained minor damages.

The investigation revealed that the taxi line paintings on the apron were inadequate, and that the pilots were not properly informed about the abnormal taxiway arrangements, which were in force in the apron due to construction works at the time of the incident. Furthermore, the ramp foreman did not use correct hand signals when marshalling the aircraft and the instructions concerning the procedures and responsibilities during power push-back were ambiguous. In addition, there were no instructions concerning these procedures in the aircraft's operating manual.

The probable cause for the incident was, that the flight crew did not receive a stopping signal from the marshaller, nor did they make initiative to stop the aircraft in correct position, because the taxi line paintings were not visible to the marshaller's position or to the cockpit. A contributing factor was the fact that there were different views about the responsibility for stopping the aircraft among the pilots and the ramp workers, which interfered with the instructions.

The investigation commission issued one safety recommendation. Finnair Oyj should include a description of the power push-back procedure in its operation manuals. This description should be available to all personnel involved in a push-back procedures.



#### **C 5/2004 L**

#### **Loss of ATC separation west of Helsinki-Vantaa airport on August 30, 2004**

On Monday 30 August 2004 at 15.53 UTC (Finnish local time -3h), a loss of air traffic control separation occurred about three nautical miles west of Helsinki-Vantaa airport between an AVRO 146-RJ 100 airliner, operated by Blue 1 Ltd. on a scheduled flight from Helsinki to Oulu (call sign BLF209), and an ATR 72 airliner operated by Aero Airlines As on a scheduled flight from Helsinki





to Maarianhamina (call sign EAY209). Both vertical and horizontal separation minima were infringed after departure.

On 16 September 2004 the Accident Investigation Board (AIB), Finland, decided to investigate the incident. Air traffic controller Mr Erkki Kantola was appointed as investigator-in-charge, and airline transport pilot Mr Jussi Haila as a member of the investigation commission.

BLF209 departed for Oulu from Helsinki-Vantaa runway 22R at 15.50, following the standard instrument departure ANT 1N. EAY209 took off from the same runway about 50 seconds later. After departure the aircraft flew radar heading 280°, having been cleared to the altitude of 4000 ft. When BLF209 had passed the airport noise boundary, which is 2.5 nautical miles of the end of Helsinki-Vantaa runway 22R and had been marked on the video map on ATC radar display, the departure radar controller (DEP) instructed BLF209 to fly to the right towards ANTON. After the turn the flight path of BLF209 intersected EAY209's flight path from left to right. The shortest horizontal distance between the aircraft was 1.3 nautical miles.

BLF209 had been cleared to climb to flight level 230. During the climb, the crew followed the company's current operation procedure, according to which the reduction of engine thrust from take-off to climb setting, flap retraction and acceleration should be made after passing through 1500 ft. For this reason the vertical speed of BLF209 was considerably slow, and EAY209 flying behind it started to reach it in altitude. The air traffic controller noticed this and issued EAY209 a vertical speed restriction of 1000 feet per minute. At the same time, the TCAS equipment of EAY209 gave a traffic advisory (TA), and the captain reduced the climb rate further into 200 ft/min, almost levelling off. However, this did not prevent the loss of vertical separation. The shortest vertical distance between the aircraft was 700 feet. The TCAS systems of both aircraft issued a TCAS traffic advisory, and the pilots of both aircraft also got the other aircraft in sight. All parties involved made an incident report in writing.

The air traffic control separation was lost, since BLF209 slowed down its vertical speed more than the controllers had estimated. Contributing factors were: 1. The radar controller cleared BLF209 to turn right towards ANTON across the flight path of EAY209, although the required vertical separation between the aircraft had already been lost; 2. The radar controller issued no other restrictions to either aircraft than the vertical speed restriction for EAY209.



**C 6/2004 L**

**Helicopter accident in Pirunpäävaara, Inari  
on October 5, 2004**

At Pirunpäävaara in the community of Inari, approximately 15 km west-southwest of Raja-Jooseppi a flight accident occurred for a Schweizer 269C-type helicopter with registration sign OH-HAV, owned by First Invest Oy, on Tuesday October 5th 2004 at 14:45 Finnish time. The helicopter was on a reindeer management flight when the tail rotor lost its power and the helicopter began to spin around its vertical axis. The pilot made an emergency landing on a mountainside. The helicopter had a two-man crew. Neither crewmember was injured in connection with the forced landing. The helicopter was significantly damaged in the forced landing. The Accident Investigation Board Finland commenced an official investigation of the event, nominating investigator Ari Huhtala as chairman and investigator Hannu Mäkeläinen as a team member. Investigator Juhani Mäkelä and chief meteorologist Ossi Korhonen assisted in the investigation

The helicopter was climbing up along the mountain slope at a low flight altitude. Suddenly, without warning, the helicopter swung to the right and began spinning clockwise around its vertical axis. The pilot noticed that he had lost the power of the tail rotor and tried to restore control, but without success. The pilot was forced to make an emergency landing in a clearing on the mountainside.

The opinion of the Accident Investigation Board is that a sudden change in the wind direction and/or speed caused a rapid rotation of the helicopter to the right. Large and rapid movements of the pedals caused a stall of the tail rotor and the pilot did not gain control of the helicopter. A contributing factor was the pilot's limited flying experience in reindeer management flights in demanding mountain and wind conditions.

The investigators did not issue any safety recommendations as a result of the incident.



**C 7/2004 L**

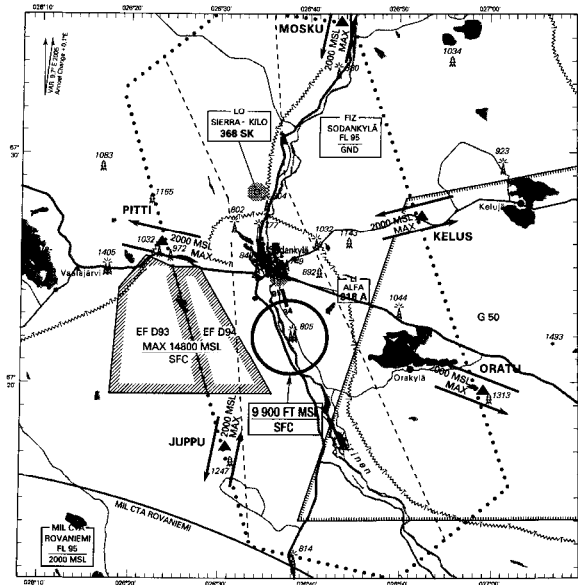
**Helicopter accident in Naruska, Salla on October 16, 2004**

A flight accident occurred involving a Robinson R22 Mariner-type helicopter (registration sign OH-HTE), owned by Helitour Oy, approximately 14 km north of the village Naruska in the community of Salla on Saturday October 16th 2004 at 16:55 Finnish time, when the helicopter's engine lost power during a reindeer management flight and the pilot made a forced landing into the forest. The helicopter had a two-man crew. Neither crewmember was injured in connection with the forced landing. The helicopter was significantly damaged in the forced landing. The Accident Investigation Board Finland commenced an official investigation of the event, nominating investigator Ari Huhtala as chairman and investigator Timo Rantala as team member. Investigator Juhani Mäkelä assisted in the investigation.

The helicopter was hovering low at an altitude of about 50 meters and began to move turning simultaneously to the right. Suddenly a bang was heard and the low-RPM warning alert was activated at the same time. The helicopter's engine had failed and the helicopter began to lose altitude continuing the turn to the right. About ten meters before ground contact the rotor blades struck trees and were broken, after which the helicopter was no longer controllable.

The distributor wheel on one of the helicopter magnetos was broken during the flight and adjusted the ignition timing earlier so that the engine stopped. Due to the low flight altitude and speed the forced landing to the terrain failed.

The investigators recommended, that the Finnish Flight Safety Authority should require that the condition of the distributor gear teeth on TCM (Teledyne Continental Motors, formerly Bendix) magnetos in use on helicopters always to be checked in connection with 100-hour service inspections. The investigators further recommended that in field conditions the flight operator should properly transport and store the fuel intended for aircraft use, as well as use a chamois or equivalent filter when refueling aircraft in such conditions. In addition, the flight operators should encourage the pilots to report about backfiring cases at engine start up.



**C 8/2004 L**

**Four helicopters flying within a danger area  
in Sodankylä, November 19, 2004**

On Friday, November 19, 2004 between the hours of 11:50 and 12:10, four Utti Jaeger Regiment MD 500 training helicopters flew into an active temporary danger area EF D121 Tähtelä in Sodankylä. The Accident Investigation Board Finland decided to investigate the incident and appointed airline pilot Jussi Haila as investigator.

The helicopters had been practicing in Northern Finland November 15-17, 2004. The detachment intended to fly from Ivalo to its home base on November 18, 2004, but due to poor weather, the return was moved to the following day. The pilots gathered on the morning of November 19, 2004 in the flight briefing room of the Ivalo airport administration building. They decided to fly the cross-country flight as individual aircraft and carry out the flight preparation together. The pilots obtained weather information from text TV, by calling a meteorologist in Rovaniemi, and by ordering the significant weather chart (SWC) from Rovaniemi flight briefing. One of the pilots asked about activity in the firing ranges, but did not request information about other danger areas. The pilots did not obtain a VFR bulletin. They moved the departures to eleven o'clock due to the weather in Rovaniemi. At that time also opened Ivalo air traffic control, which informed the aircraft of the departure times and wired these to Rovaniemi air traffic control. The pilots were not in radio communication with Rovaniemi air traffic control. The helicopters flew about five minutes apart at an altitude of 30-100 meters. The flight weather was sufficient for VFR flight in accordance with regulations. In Sodankylä, at temporary danger area EF D121 Tähtelä, atmospheric measurements were being performed with a balloon tethered to the ground. At the moment of the incident, a balloon 4.4 meters long and 2 meters in diameter was at an altitude of about 1 000 meters inside a cloud. Visibility was about three kilometers, cloud height was about 300 meters, and wind from the south at four meters per second. The helicopters passed the balloon's tether line at a distance of about 700-2 000 meters. The pilots did not see the balloon or its tether line.

During the investigation, it was determined that the guidance given to the pilots for flight planning was sufficient. The distribution and use of aviation safety information published by the Civil Aviation Administration on the Internet should be developed.

The dangerous situation arose when the helicopter pilots did not obtain a VFR bulletin for their use in flight preparation, or did not otherwise ascertain all of the existing danger areas on the route and flew into active danger area EF D121 while avoiding firing range D94.

The Utti Jaeger Regiment should direct its pilots' attention to the obtaining of necessary information for cross-country flights. The need for, and use of, a VFR bulletin in flight planning should be particularly emphasized. The Utti Jaeger Regiment should also clarify the usefulness of the AIS and MET pages on the Civil Aviation Administration's Internet site in its operation. For this reason, flight detachments or individual aircraft should have wireless Internet connections available for their use when operating from outside bases.

The Civil Aviation Administration should obtain aviation authority approval for weather pages (MET) published on the Internet, as well as see that airport flight briefing areas have a printer-equipped Internet connection for pilot use so that flight safety information published on the Internet can be utilized in flight operations.



C 1/2005 L

**Ultra-light aircraft accident at Vammala Ylistenjärvi on January 6, 2005**

Photo: L. Suutari

On January 6, 2005, at 11.25 local time, there was an accident at Vammala, lake Ylistenjärvi, when an ultra-light aircraft HybredR 503, manufactured by Medway Microlights Ltd crashed into ice of the lake. In its decision C 1/2005L, the Accident Investigation Board Finland decided to conduct an investigation into the accident. Investigator Tapani Vääntinen was nominated as investigator-in-charge and investigator Toni Mäkelä as a member of the investigation commission.

The pilot had performed taxiing for practising purposes with his own, ski-equipped aircraft earlier on a field near his house. After determining that the field is too small for practising, he then continued the practice on the frozen lake. In addition, his purpose was to perform take-offs and landings, where the aircraft would be airborne for a short period of time. The pilot made first two large oval-shaped circles on the lake. At the end of the second circle, the aircraft took off and climbed at a quite steep angle. Due to the sudden increase in the vertical speed, the pilot lost the control of the aircraft. The rapid climb and deteriorated visibility resulted the pilot to suddenly reducing the throttle to idle. As a result, the aircraft stalled, the pilot lost the ultimate control and the aircraft crashed. The pilot sustained serious injuries.



The aircraft had climbed up to 10–30 meters height and travelled 300 meters before it crashed at an angle of approximately 45 degrees. The aircraft was tilted to the right approximately 30 degrees. The location of the crash-site were 61° 15' 16" N and 22° 55' 46" E. and the elevation was 89 meters above the mean sea level. The ultra-light aircraft sustained major damages.

The cause of the accident was the pilot's decision to practise taxiing and short flights without training in the weather conditions which were clearly below minimum requirements.

The investigation commission presented no safety recommendations.

### Recommendations

The aviation accident investigations that were completed in 2005 yielded a total of 19 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 2005 were addressed to the following authorities and parties.

Civil aviation administration	-
Flight safety authority	6
Finnish aeronautical association	-
Airports	-
State institutions	-
Airline companies / aviation schools	7
Pilots	1
Aircraft manufacturers	-
General recommendations	-
Investigations without recommendations	5

Of the recommendations issued in 2000-2003, ca. 55% have been implemented by the end of the 2004. Implementation monitoring of the recommendations issued in 2004 and 2005 was under work at the end of the year 2005.



### Aviation investigations in 2001–2005

Accidents investigated	2001	2002	2003	2004	2005	TOT
Serious accidents (A-investigations)	-	-	-	-	-	-
Other accidents (B- and C-investigations)	17	15	12	12	13	69
<b>TOTAL</b>	<b>17</b>	<b>15</b>	<b>12</b>	<b>12</b>	<b>13</b>	<b>69</b>

Investigations as per type of accident/incident	2001	2002	2003	2004	2005	TOT
Accidents	7	4	2	6	7	26
Damages	6	5	3	1	1	16
Losses of separation	4	5	5	1	-	15
Other	-	1	2	4	5	12

Investigations as per aviation category	2001	2002	2003	2004	2005	TOT
Commercial aviation	7	9	8	3	8	35
Other	10	6	4	9	5	34

Investigations as per aircraft category	2001	2002	2003	2004	2005	TOT
Commercial aircraft	8	7	8	3	5	31
General aviation aircraft, helicopter	6	6	3	4	6	25
Hobby and ultra-light aircrafts	3	2	1	2	1	9
FAF aircraft	-	-	-	3	1	4

Personal injuries		2001	2002	2003	2004	2005	TOT
Deceased	Pilot	2	2	1	3	2	10
	Passenger	-	-	3	1	12	16
	<b>Total</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>14</b>	<b>26</b>
Seriously injured	Pilot	1	2	1	1	2	7
	Passenger	2	-	1	1	1	5
	<b>Total</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>12</b>
Slightly injured	Pilot	3	-	1	-	1	5
	Passenger	-	-	1	-	3	4
	Other	-	-	-	-	-	-
	<b>Total</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>4</b>	<b>9</b>
<b>TOTAL</b>		<b>8</b>	<b>4</b>	<b>8</b>	<b>6</b>	<b>21</b>	<b>47</b>







## RAIL

In 2005 the Accident Investigation Board commenced 11 rail accident investigations including one category B investigation, nine category C investigations and one safety study (S category). The category B investigation concerned the derailing of a passenger car as the result of rail damage. Seven of the category C investigations concerned the derailing of freight trains, one concerned the collision with a rail barrier of a reversing passenger train, and one concerned a level-crossing accident in which a shunting unit locomotive derailed following a collision with articulated vehicle.

Four category C investigations were completed in 2005. The most significant of the completed investigations concerned a collapsing of railway bed which occurred at a main line underpass construction site.

A total of 6 new recommendations were issued in 2005. The annual recommendation implementation monitoring meeting was not held in 2005.

Rail accident investigators participated in a meeting held by the Nordic Rail Accident Investigators (NRAI) forum in April in Copenhagen. The meeting included a review of examples of accident investigations in different countries, the issue of investigator training was raised and it was agreed to exchange written training materials immediately after the meeting. A demonstration was also given of Danish level-crossing equipment. Finland's rail accident investigators held the year's second NRAI meeting in November in Vantaa. The headline topic for the meeting was the examination of examples of different countries' accident investigations, with a focus on information exchange, recommendations and recommendation implementation monitoring procedures and opportunities for utilising the recommendations of different countries and the experiences derived from them. In addition, the issue of investigator training was again brought strongly to the fore, and a working group was established to pursue the matter further.

Cooperation between European rail accident investigators, as initiated at the meeting of Nordic rail accident investigators, got underway in 2005. European rail accident investigators held their first joint meeting in Amsterdam in June. A total of 21 countries were represented at the meeting. The meeting focussed on sharing information on the investigation approaches and future outlooks of different countries. It was decided to hold the next meeting in London in 2006, possibly with some participants being invited to the meeting from outside Europe.

The Chief Rail Accident Investigator participated in the two meetings held by the European Railway Agency's (ERA) different working groups. The groups addressed the networking of accident investigation bodies and definitions and indicators concerning railway safety. The working groups will reconvene in 2006.

Rail accident investigators gave lectures on accident investigation and provided workplace instruction and orientation for new, part-time investigators.

Towards the end of the year, the requisite modifications and changes that had been drawn up in 2002 and updated in 2003 and 2004, were made in the Operating Manual and the Investigator Guidelines.

### Investigations commenced in 2005

One category B investigation, nine category C investigations and one safety study were commenced in 2005. Among the accidents and incidents accepted for investigation were one passenger carriage derailing, seven freight train derailings, a passenger train collision with a rail barrier and one level-crossing accident. The safety study concerns level-crossing accidents.

Identifier	Date	Title of the investigation
B 1/2005 R	30.3.2005	Passenger car derailing between Saakoski and Jämsänkoski
C 1/2005 R	10.3.2005	Collision of shunting unit and articulated vehicle in Mäntyluoto
C 2/ 2005 R	20.4.2005	Reverse running passenger train colliding with rail barrier in Helsinki
C 3/2005 R	27.4.2005	Derailment of a Russina freight car loaded with pellets in Eskola
C 4/2005 R	28.4.2005	Derailment of five freight train cars in Heinävesi
C 5/2005 R	15.7.2005	Two freight cars derailing at Kontiomäki
C 6/2005 R	30.8.2005	Liquid gas wagon derailing at Raahe
C 7/2005 R	31.10.2005	Freight train locomotive and one wagon derailing at Peräseinäjoki
C 8/2005 R	28.12.2005	Freight car derailing at Kontiomäki–Vartius line
C 9/2005 R	31.12.2005	Freight car derailing and member of train crew injured at Tuupovaara
S 1/2005 R		Safety study concerning level crossing accidents

### Investigations completed in 2005

In 2005 altogether four C-investigations were completed. One of the investigations had been commenced in 2003 and 3 in 2004.

Identifier	Date	Title of the investigation
C 11/2003 R	20.12.2003	Collapsing of railway bed in Urpia underpass site at Vantaa
C 5/2004 R	12.5.2004	Wheelset of a shunting work locomotive derailing on Kokkola railway yard
C 7/2004 R	15.6.2004	Incident between Kempele and Liminka, Finland, caused by an escaping rail-sleeper wagon
C 9/2004 R	15.7.2004	Member of train crew injured in shunting work on Hamina railway yard



#### **C 11/2003 R**

#### **Collapsing of railway bed in Urpia underpass site at Vantaa on December 20, 2003**

On Saturday December 20, 2003 a hazardous situation arose in train traffic at Vantaa, Finland when the railway bed had collapsed in a bridge worksite in the Urpia station underpass. A Pendolino train having left Helsinki at 5.30 hrs travelled past the site of the collapse at a speed of 30 km/h. On the place of the collapse the train "made a low curtsey" but did not derail. The curtsey caused no personal injury or material damage in the train; the passengers only experienced an unpleasant feeling. The train driver immediately advised the remote controller of the situation by line-radio and asked him to close down the line. Also the adjacent track had to be closed at 13 hrs. The adjacent track was reopened for traffic on Sunday at 14.00 hrs and the track on the collapsed bed, on Sunday at 20.15 hrs.

Already the evening preceding the incident, the railway bed in question displayed some irregularities: the passing trains communicated the remote controller notices of poor condition of the track. In fact as due to the poor condition of the track, a temporary speed limit was set up at the underpass. Then after midnight, the bed finally collapsed.

To repair the collapse of the railway bed, about 100 m of track had to be removed, and the collapsed support wall had to be dismantled and replaced by a new one. To reinforce the new support wall, a counterbed measuring a height of about 2.5 m and a width of about 15 m had to be constructed. The counterbed and the track understructure required about 450 m<sup>3</sup> of soil to be transported to the site, as well as ballast for the bearing layer of the railway bed. In all, the upgrading and repair costs amounted to about €80,000.

The collapse of the railway bed that developed to a hazardous situation was caused by the lower part of the support wall of the bed having spread as the groundwater basin of the underpass had been constructed too close to the support wall. In fact the work of excavation of the groundwater basin had been commenced although this particular work phase failed to have an approved work plan. The system that monitors the condition of the track and train safety was unable to disclose the development of the settlement discovered in the track, to a collapse, and hence it could not prevent the travelling of the train to the site of the collapse.

In order to prevent corresponding hazardous situations and incidents, the Accident Investigation Board of Finland recommends that for each worksite an unambiguous written specification should be drawn up on the detailed responsibilities and obligations of the workers in terms of the operating condition of the track and on their rights to engage auxiliary personnel and set restrictions to traffic operation. Moreover the Accident Investigation Board recommends that in underpass and

bridge worksites, for every work phase that impacts the stability of the railway bed and the track, an approved plan be required before the commencement of the work in question, and that the response measures to different situations be underscored and integrated in the training provided by the Emergency Center.



**C 5/2004 R**

**Front wheelset of locomotive derailling in  
Kokkola on May 12, 2004**

On May 12, 2004, an incident took place on Kokkola railway yard when the front wheelset of a locomotive derailed. The incident did not involve any personal injury and the damage suffered by the track and the rolling stock was relatively modest. The wheelset derailed while the locomotive was pushing an open freight wagon that was loaded with an empty chlorine container.

The wheelset of the locomotive derailed as caused by an excessive height deviation in the turnout.

The Accident Investigation Board of Finland recommends that after each derailment incident on a railway yard, the turnouts and points and switches area should be inspected and the gauge and the height deviation checked by measuring. As based on the measurement results, any requisite local corrections should be effected.



**C 7/2004 R**

**Incident between Kempele and Liminka, Finland, caused by an escaping rail-sleeper wagon, on June 15, 2004**

On Thursday morning June 15, 2004, an incident occurred between Liminka and Kempele when an empty open wagon of a track work team escaped to a railway line toward Liminka and toward a meeting passenger train. The wagon had been left standing on a siding at Kempele railway yard, while a service railcar was being moved to the other end of the siding, and then suddenly the wagon set out to travel by itself. The driver of the service railcar then advised the remote control operator of the escape of the wagon, and the remote control operator ordered the approaching passenger train to stop. The engine driver immediately stopped the train. The distance between the train and the railcar was then eight kilometres. The incident caused no personal injury, rolling stock damage or any damage to the track or the equipment. The passenger train ran late by 16 minutes.

The incident was a result of a failing securing of the immobility of the wagon that then escaped onto the railway line. The immobility of the wagon had in fact been secured by an air brake as its idle time was only to be very short. But the brake shoe having taken an inappropriate position, turned and the brakes disconnected. The inappropriate position of the brake shoe was only discovered after the wagon had escaped and it had been fetched back again. As contributing to the escaping of the wagon to the railway line was the fact that Kempele railway yard inclines toward the railway line.

The Accident Investigation Board of Finland does not publish any relevant new recommendations, as the investigation report as such underscores the importance of the securing of the immobility of railway cars.



**C 9/2004 R**

**Member of train crew injured in shunting work on Hamina railway yard on July 15, 2004**

On Hamina railway yard on July 15, 2004 at 17.28 hours, an accident took place where a train crew member was seriously injured when he was run over by the wheels of a railway car. Later on, an arm and a leg of the worker had to be amputated.

The investigation failed to disclose the direct cause of the stumbling of the train crew member, but among the probable causes, there are the glove of the worker as having stuck in the railway car, the reading glasses worn by him, the speed of the shunting unit, or the unevenness of the surface of the ballast at the scene of the accident. Moreover as contributing to the generation of the accident is the fact that the tail signal lamp of the car was in an irregular place and the worker in question failed to follow the agreed working plan.

In order to prevent corresponding accidents, the Accident Investigation Board recommends that the General Railway Yard Safety Regulations be supplemented with a provision that requires a shunting unit worker to advise the other shunting-unit crew members of his irregular working practice. Furthermore the Accident Investigation Board recommends that the ballast adjacent to the 037 track on Hamina railway yard be replaced by such ballast that meets the specifications for a pedestrian passage.

## **Recommendations**

In 2005 a total of six new recommendations were issued. Two recommendations were addressed to the Finnish Rail Administration, three to both the Finnish Rail Administration and VR-Group Ltd., and one to the Department for Rescue services of Ministry of the Interior. The recommendations concerned railway yard inspections after derailment, responsibilities and obligations on worksites, approval of work phases on underpass work sites, training of Emergency Response Centre personnel, shunting unit worker's responsibilities for advising crew members of irregular working practices and specifications on railway yard's pedestrian passages. The recommendations can furthermore be broken down as per target category, as follows:



Rolling stock	-
Track equipment	1
Traffic control equipment	-
Operating directions	4
Rescue action	1

In 2005 there was no meetings concerning the monitoring of the implementation of the recommendations. At the end of 2005, the total number of issued recommendations was 200, 121 of which (61%) had been adopted and implemented.

### Rail investigations in 2001–2005

The following tables specify the accidents and incidents investigated by the Accident Investigation Board over the past five years, as well as the relevant personal injuries.

Accidents investigated		2001	2002	2003	2004	2005	TOT
Serious accidents (A-investigations)	Collision	-	-	-	-	-	0
	Derailment	-	-	-	-	-	0
Other accidents (B- and C-investigations)	Collision	4	3	2	1	2	12
	Derailment	5	4	8	6	8	31
	Occupational accident	2	-	-	1	-	3
Incidents (B- and C-investigations)		1	4	1	2	-	8
<b>TOTAL</b>		<b>13</b>	<b>11</b>	<b>11</b>	<b>10</b>	<b>10</b>	<b>55</b>

Personal injuries		2001	2002	2003	2004	2005	TOT
Deceased	Passenger	-	-	-	-	-	0
	Personnel	-	-	-	-	-	0
	<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Seriously injured	Passenger	1	-	-	-	-	1
	Personnel	6	-	-	2	1	9
	<b>Total</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>10</b>
Slightly injured	Passenger	44	-	-	-	-	44
	Personnel	9	-	4	-	-	13
	<b>Total</b>	<b>53</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>57</b>
<b>TOTAL</b>		<b>60</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>67</b>







## MARINE

Eight marine accident investigations were commenced in 2005. None of the accidents involved serious personal injury. It was decided to conduct an additional safety study of fairway navigation as an extension to the *Pilotage practice and culture in the light of accidents* safety study report. Three other safety studies were also ongoing. These concerned the results obtained in the investigation of pilotage accidents, the safety of domestic passenger vessel traffic in the light of investigated accidents and incidents, and navigation bridge crew fatigue.

Of the cases examined, one concerns a car fire which occurred on the car deck of a passenger ferry, and four concern groundings. One of the latter cases involved the sinking of a pleasure craft tugboat after running aground. Furthermore, an investigation has been commenced into the collision of a ro-ro vessel with a pier and the collision of a road ferry with a minesweeper cable.

Six marine accident investigations were completed in 2005. These included two groundings, three collisions and the sinking of a pleasure boat. Completed investigations include e.g. a maritime safety culture investigation conducted as part of the passenger ferry ISABELLA accident investigation and the decoding of VDR (voyage data recorder) voyage data as part of the ms FINNCLIPPER accident investigation. The investigation of the all-weather craft HÖGSÅRA and the liaison vessel ROSALA II provided valuable practical experience of implementing the existing cooperation agreement with the Finnish Navy. Furthermore, ten brief preliminary investigations were commenced.

Eight of the commenced and completed investigations involved cooperation with the flag state of the vessel concerned or with the investigating authorities of the state of occurrence. These countries included Sweden, Denmark, Estonia, Latvia and Cyprus. The cooperation was based on the investigation recommendation of the International Maritime Organization (IMO).

Representatives of the Accident Investigation Board of Finland participated in two meetings held by the European Maritime Safety Agency (EMSA) in Brussels in February and November. Contact with EMSA has been actively maintained. In November, the European Commission published a directive proposal concerning the investigation of marine accidents.

The IMO began updating the accident investigation manual *Code for the Investigation of Marine Casualties and Incidents* with the aim of updating it from a set of recommendations to a set of regulations. The Chief Marine Accident Investigator participated in March as a representative of Finland at the meeting of the IMO subcommittee, at which accident investigation results and the reform of the accident investigation recommendations were addressed.

Marine accident investigators participated in the 14<sup>th</sup> annual meeting of the Marine Accident Investigators' International Forum (MAIIF) at Vanuatu in August. The Chief Marine Accident Investigator was re-elected as Deputy Chairman of the MAIIF.

The Accident Investigation Board of Finland hosted the first meeting of the European Marine Accident Investigators' International Forum (EMAIF) in Helsinki at the beginning of March. Participants at the meeting included 28 representatives from 18 countries plus representatives from EMSA, the MAIF secretariat and the EU's accident investigation team of experts. The decision was taken at the meeting to hold regional MAIF meetings on an annual basis.

A meeting between Estonian and Finnish accident investigators was held in June in Helsinki with the aim of furthering cooperation between the two countries.

Investigators gave a series of lectures and talks on the investigation of marine accidents and their results at more than 15 events in Finland and abroad.

Furthermore, the Accident Investigation Board is involved in the building of a network to improve harbour safety as part of the marine safety project of Kymenlaakso Polytechnic.

### Investigations commenced in 2005

One category B marine accident investigation, seven category C marine accident investigations and one safety study were commenced in 2005. Investigations B 1/2005 M, C 4/2005 M and C 5/2005 M involve cooperation with Swedish investigation authorities.

Identifier	Date	Title of the investigation
B 1/2005 M	19.5.2005	Fire on car deck onboard passenger-car ferry ms AMORELLA (FIN)
C 1/2005 M	20.1.2005	Ms PAULINE RUSS (Antigua and Barbuda), grounding in Hanko
C 2/2005 M	25.6.2005	Tug boat ss HEIKKI PEURANEN (FIN), grounding and sinking in Puumala
C 3/2005 M	31.8.2005	Roro-vessel TRANSLANDIA (FIN), collision with the dock in Tallinn
C 4/2005 M	5.10.2005	Ms SILJA SERENADE (FIN) and KBV-046, incident in archipelago of Stockholm (investigation by relevant authority in Sweden)
C 5/2005 M	10.12.2005	Mt OMEGA AF DONSÖ (SWE), grounding in fairway to Sköldvik
C 6/2005 M	21.11.2005	Ms NATHALIE (FIN), grounding in Hanko
C 7/2005 M	10.11.2005	Road ferry PROSTVIK 1 and mine sweeper KUHA 26, collision with the sweeper cable
S 1b/2004 M		Fairway navigation (Summary of pilotage accidents during 1997–2000)

### Investigations completed in 2005.

Two category B investigations and four category C investigations were completed in 2005. Investigations B 1/2001 M, B 1/2004 M and C 7/2004 M involved cooperation with Swedish investigation authorities.

Three of the investigation reports have also been published in Swedish and one has been translated into English. One investigation report has been published exclusively in Swedish (investigation by Swedish Maritime Administration).

Identifier	Date	Title of the investigation
B 1/2001 M	20.12.2001	Passenger-car ferry ms ISABELLA, grounding in Staholm, Åland (Published also in swedish)
B 1/2004 M	20.1.2004	M/V FINNCLIPPER, grounding off Kapellskär (Published also in English)
C 3/2001 M	22.4.2001	F/F SARA, collision with an unknown vessel southeast of Gotland (Published also in Swedish)
C 5/2003 M	18.5.2003	Boat accident offshore Pärnu and five other boat accidents
C 3/2004 M	16.3.2004	The navy allweather craft HÖGSÅRA and archipelago ferry ROSALA II, collision in the narrow fairway on the north side of Öro (Published also in Swedish)
C 7/2004 M	30.8.2004	Ms ISABELLA (FIN) /ROSPIGGEN (SWE), incident at harbor of Stockholm. (Investigated by the relevant authority in Sweden, Sjöfartsinspektion) (Published exclusively in Swedish)



#### B 1/2001 M

**Passenger-car ferry ms ISABELLA, grounding in Staholm, Åland on December 20, 2001**

The Finnish passenger-car ferry ms ISABELLA ran aground in Åland archipelago on December 20th 2001. She was sailing from Turku, Finland to Stockholm, Sweden. Onboard were 663 passengers and 157 crew members. The accident occurred whilst one of ship's mates was carrying out his piloting test as part of his examination for the line pilot certificate. The bridge watch crew consisted of officer of the watch, examinee and a line pilot, who acted as a lookout. Additionally there was a pilot inspector from the Finnish Maritime Administration supervising and accepting the piloting test.

ISABELLA's bridge resource practices were not in balance with the latest technical developments and didn't comply with the modern definition of an effective team work. In addition to that, piloting

test routine broke the regulations and maritime safety practices. These habits are a part of maritime culture and the shortcomings in this culture created a clear safety risk at ISABELLA.

According to commonly accepted approach the responsibility of improving bridge resource management still remains on the master, instead of having been transferred to the maritime authorities and shipowners. This has led to a situation where the master has no support for his decision making. The goals of regulations are not inherent in bridge work. Adequately high level of safety can only be achieved with common and criteria fulfilling bridge practices. This will be realizable only if the external organisations have the main responsibility of planning the bridge routines.

The piloting test practices and weather conditions increased the safety risk.

Usual work habits were biased due to the piloting test. The examinee was not allowed to use his printed route plan. Forbidden information also included the integrated navigation system's electronic route plan. Piloting test arrangements indicate the historical culture of the authorities. The execution methods of the test are not in balance with the modern navigational technology of the ships.

The weather forecast indicated wind speeds of 17–21 m/s. This information led to an alternative route plan being considered before ship's departure from Turku. According to this new plan the Långnäs harbour in Åland was not visited. However, the piloting test was still scheduled. During the voyage the wind force turned out to be exceptionally strong and made the piloting test very demanding but it was not cancelled.

In Stockground near Långnäs there were difficulties in controlling the turn, because nobody noticed autopilot's exceptional rudder usage to the port. Additionally small steering commands during the turn reduced the ability of the autopilot to control the turn. These were due to special characteristics of the autopilot. These characteristics were not known by the bridge crew. Change to the manual steering at later a stage was not sufficient in preventing the grounding.

Several causes impaired the correct assessment of the vessel dynamics by the crew. They had no possibility to know all details of the autopilot, especially the adaptivity. This caused unawareness of autopilot's performance. The rudder indicator was not actively observed and due to the piloting test the information contents of the radar display was reduced. All these factors raised the threshold to change to manual steering.

After the first grounding the ship had three more groundings before the situation was under control. Ship's bottom plates as well as port rudder and port main propeller were damaged. Since the vessel had no instantaneous hazard of capsizing nor sinking, the passengers were evacuated to upper decks and the ship was not abandoned. The next morning she was towed to Långnäs harbour.

In ISABELLA's case the internal rescue tasks were mainly executed well. However, the maritime authority's instructions don't adequately support the definition of ships rescue plan on concrete level. ISABELLA's rescue plan was inadequate in the dealing with passenger crowd behaviour, when defining the distribution of crew resources. Additionally, some communication links of the rescue organisation were insufficient in some parts.

The accident investigation commission addresses safety recommendations to the Finnish Maritime Administration (FMA) for changing the piloting test. Ship owners are recommended to enhance the training for integrated navigation systems and further develop standardised bridge routines. Furthermore the commission recommends that FMA requires and controls that the safety plans of vessels include optional scenarios of action according to different situations and requirements related to communication and command arrangements.



**B 1/2004 M**

**M/V FINNCLIPPER, grounding off Kapellskär  
20.01.2004**

Ro-Ro- / passenger vessel FINNCLIPPER left the Kapellskär harbors pier No.4 on 20.01.2004 at 02.03 Finnish time towards Naantali. Master did take care of the departure arrangements by himself. He estimated the northeast wind speed to be 12–17 m/s. North eastern wind presses the vessel against the pier from the port side. Master took first the bow out from the pier by bow thrusters while the stern was lying on the last fender towards shoreline. There after the stern was let go by increasing the main engine power forward, the rudders being to the starboard.

The Chief officer entered the bridge at 02.06 when the ship was already moving. Chief officer informed master that the stern was coming closer to the pier and master made correction alignment to the right by the rudder. This is how it was continued until the stern had passed the piers edge. After this the master changed his steering position in the middle of the bridge, the rudder being in the middle, the main propellers output 23 % forward and he didn't activate the bow thrusters in the middle cockpit steering position.

As per VDR recording the "Predictor" did point the vessel to drift towards the buoy north of the Kapellskärs skäret. Neither the Master nor the Chief officer did monitor the "Predictor"s display. The passage was resumed with similar propeller blade-and rudder adjustments, bow thrusters being in zero position. About 02.09 Master turned the rudder about 20° to the left leaving the other means of steering as they were. The vessel was continuing the drift due to lack of steering efforts towards to the before mentioned buoy. When the stern was coming closer to the buoy 02.09.50 master increased the propellers output to 32 % and turned rudder 15° to the starboard in order to avoid the stern to collide on the buoy. The vessels sterns sb-side collision bar did collide on the buoy at 02.10.30 and there after the vessel run on the ground located on the north eastern side of the island. The vessel run over the ground and the vessels bottom was damaged in the entire length.

The vessel's damages did neither cause any danger to sink nor stability problems. The vessel returned to Kapellskär at 03.36 where the passengers and cargo was discharged.

The reasons which lead to the accident were inadequate familiarization to the ships handling and its equipment, lack of use of the steering- and navigational equipment and lack of bridge resource management.



**C 3/2001 M**

**F/F SARA, collision with an unknown vessel southeast of Gotland, March 21, 2001.**

The fishing vessel SARA from Närpes, Finland was fishing southeast of Gotland island in the Baltic Sea on April 20–21, 2001. She carried a crew of three persons. As the weather got worse in the evening, the vessel was stopped and she made no way through the water. After midnight at 0230 hours the skipper, being on the bridge, noticed that another vessel hit the SARA.

SARA's port beam was damaged and the vessel started to take in water. All pumps, including the cooling water pump for the main engine were used to pump water out. SARA sent out a distress message.

MRCC Gothenburg sent out a helicopter to bring more pump capacity onboard. With these pumps the situation was stabilized. Another Finnish fishing vessel in the area came to SARA and towed her to the Gotland coast where a Swedish coast guard vessel took SARA on tow and helped her to Ronehamn in Gotland.

The fishermen were able to get only a brief glimpse of the vessel that had rammed SARA. They said that it probably was a large cargo vessel in ballast with blue hull and either her name or homeport might include the letters "PORT". The investigation listed the vessels in area and answered MRCC's MAYDAY RELAY. The vessel with the shortest distance to the accident site was the Bahamas flag tanker HAMANE SPIRIT that was on ballast voyage to Ventspils, Latvia.

There are many facts that support the view that it was HAMANE SPIRIT that had been the vessel that rammed SARA. This could not be fully proved. The investigation did not succeed in getting a complete picture of the traffic situation in the accident area in spite of numerous attempts.

There were no physical injuries to the persons onboard. SARA's hull was damaged to such an extent that the hull insurers considered her a total loss.



### **C 5/2003 M**

#### **Boat accident offshore Pärnu June 6, 2003 and five other boat accidents**

This accident investigation report is composed of three parts. The first part deals with sinking of a Sun 33 -type motor boat offshore Pärnu 8.6.2003. The second part includes short presentations of five boat accidents where a boat started leaking without a hull damage caused for instance by a grounding or a collision. One of these boats sunk while fastened to a jetty when waves from stern started throwing in water. The third part of the report gives safety recommendations on the basis of all investigated cases.

The Sun 33 -type pleasure boat, built 1990, was on a passage from Hanko to Pärnu via Haapsalu when the accident occurred. There were two men on board. The boat called Haapsalu 7.6.2003 for refuelling and resumed her passage the same evening towards Pärnu. The boat navigated through the marked sea area between Manilaid and Kihnu islands. From the last marked gate in a position of about 64° 12,8 N 024° 13,2 E the boat turned towards the lights of Pärnu.

The sterndrive of the boat jammed in a big fishing trap at about 24.00 in a position 58° 15,2 N 024°18,8 E. The ropes jammed on the propeller stopped the engine and the two man crew was not able to get rid of the ropes by own means. The wind and 0,5-1,0m high waves from the stern filled the boat by water and she sank at about 01.50, in the above mentioned position, despite of attempts to empty the boat. The two men had to abandon the boat. The coast guard from Pärnu rescued the men 8.6.2003 at 03.27.

The accident was caused by the boat jamming in a faulty marked fishing trap, and the boat having a low freeboard at stern and not watertight hatches and skin fittings. Waves could flood the cockpit through a gate at the transom and the not watertight engine space hatches let the water into the engine space.

Also one of the five other accidents, considered shortly in the report, was caused by waves flooding the cockpit through a gate at the transom and the water flowing into the engine space through the not watertight hatches. Hits by waves had detached the door at the transom gate, due to which the freeboard at stern decreased significantly.

The accident investigation commission recommends that the water tightness and freeboard requirement of sterndrive cabin boats at stern, at stern cockpit and at the door from cockpit to cabin



should be checked. It is also recommended that these items should be part of boat owners' training and part of the voluntary boat inspection.

The other four flooding cases investigated occurred due to breaking or corrosion of sea water piping or seacocks. On the basis of these cases, the accident investigation commission recommends that the endurance of critical parts exposed to corrosion or other ageing should be evaluated and a recommendation should be given for their renewal time.

In addition, the accident investigation commission recommends that the navigation training given to boat owners should also emphasise the importance of route planning and finding out the special characteristics of the passage sea areas, and the importance of taking into account special situations.

### **C 3/2004 M**

#### **The navy allweather craft HÖGSÅRA and archipelago ferry ROSALA II, collision in the narrow fairway on the north side of Örö on 16.3.2004**



On a scheduled trip to Fort Örö the archipelago ferry ROSALA II collided with the Navy all-weather craft HÖGSÅRA that had departed Örö to an unscheduled voyage. The collision took place on March 16, 2004 in dense fog as the vessels proceeded in the narrow fairway, which had been opened through the ice-covered sea. The fairway is not marked in the general traffic charts but it is surveyed and marked for the use of the local archipelago traffic.

ROSALA II had 2 passengers and crew of 3 and as cargo one lorry. HÖGSÅRA had 13 passengers and crew of 3. No physical harm was caused in the accident. HÖGSÅRA got serious damages to her bridge but ROSALA II got only minor damages. There was significant delay in informing the authorities of the collision. This delay did not endanger persons involved.



The investigators recommend that coastal passenger traffic operators and the service traffic of the military craft should have common practices to avoid collisions and risk situations for the use of shared fairways.



**C 7/2004 M**

**Ms ISABELLA (FIN) /ROSPIGGEN (SWE),  
incident at harbor of Stockholm on August  
30, 2004**

The Finnish passenger-car ferry ms ISABELLA left Stadtgårdhamn, Stockholm at 07.43 the same time as Swedish vessel ROSPIGGEN left Danvik canal. Near Kvarnholm two vessels started to near each other and they collided west of Blockhusudds lighthouse at 07.55.

The collision was not noticed by the crew at ms ISABELLA's bridge and it resumed her voyage to Mariehamn, Åland. Damages to ms ISABELLA were only minor scratches on paint. ROSPIGGEN was damaged to her left light stand, bridge roof, two radar antennas, mast, funnel, antennas and Aldis-lights. Smaller boat with its davits was also damaged. Autopilot and two GPS-systems went off-line as they were damaged. After informing ISABELLA of the collision ROSPIGGEN sailed to dockyards for renovation.

The reason for collision was lack of look out. Contributing to the collision was ms ISABELLA's speed that exceeded the speed limit on harbour area and the fact that ISABELLA's crew did not track ROSPIGGEN's movements.

The accident was investigated by the relevant authority in Sweden (Sjöfartsinspektion). Martti Heikkilä, Chief Maritime Investigator of the Accident Investigation Board of Finland, participated in the investigation as an observer.

The investigation report is exclusively available in Swedish.

### **Recommendations**

The investigation reports on marine accidents completed in 2005 comprised altogether 11 safety recommendations. Most of the recommendations were addressed to the Finnish Maritime Administration and to shipping companies. One recommendation concerning navigation channels and their markings was addressed to Swedish Maritime Administration. Two of the recommendations were addressed to both Finnish Maritime Administration and boat organizations.



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

Vessel operation directions	4
Pilotage directions	1
VTS directions	1
Directions for emergency radio communications	-
Navigation and route planning	1
Navigation channels and their marking	1
Vessel equipment and facilities	3
Vessel stability	-
<u>Other</u>	-
<b>Total</b>	<b>11</b>
Finnish Maritime Administration	4
Other authorities	2
Pilotage organisation	-
Shipping companies	3
Organizations	2

### Marine investigations in 2001–2005

The following tables include the marine accident and incident investigations commenced in 2001-2005 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	2001	2002	2003	2004	2005	TOT
Serious accident (A-investigation)	-	-	-	-	-	-
Other accidents (B- and C-investigation)	16	14	11	16	8	65
<b>TOTAL</b>	<b>16</b>	<b>14</b>	<b>11</b>	<b>16</b>	<b>8</b>	<b>65</b>
Safety studies	-	1	2	1	1	5



<b>Investigations as per accident category</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>TOT</b>
Grounding	6	6	5	8	3	<b>28</b>
Fire	3	1	1	-	1	<b>6</b>
Sinking	2	-	2	4	1	<b>9</b>
Collision	2	4	1	2	2	<b>11</b>
Other	3	3	2	2	1	<b>11</b>
<b>TOTAL</b>	<b>16</b>	<b>14</b>	<b>11</b>	<b>16</b>	<b>8</b>	<b>65</b>

<b>Investigations as per resulting impact</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>TOT</b>
Deceased	1	4	1	2	-	<b>8</b>
Seriously injured	-	-	-	2	-	<b>2</b>
Slightly injured	1	12	-	4	-	<b>17</b>
Environmental damage	-	1	-	1	-	<b>2</b>





## OTHER ACCIDENTS

“Other accidents”, denoted by the letter Y, refers to accidents or serious incidents other than aviation, marine or rail accidents. As provided in the Act on Accident Investigation (3.5.1985/373), all serious accidents must 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 believe that the investigation will generate important information that may contribute to the improvement of general safety and the prevention of accidents.

Investigation work was carried out by a total of seven investigation commissions in 2005. Predominant serious accidents included the serious road traffic accident at Konginkangas (2004) and the natural disaster in South-East Asia (2004). Further major investigations involved the explosive fire at Tornio, the coach accident at Halikko, two roof collapses and one mortar incident, the latter being defined as a serious incident by the appointed investigation commission.

Both serious accident investigations were concluded in 2005. The investigation report of the South-East Asian natural catastrophe was submitted to Prime Minister Matti Vanhanen and Minister of Justice Johannes Koskinen and the investigation report of the Konginkangas accident to Minister of Justice Leena Luhtanen. A press conference was held in connection with the submission of the reports, at which both investigations generated considerable media interest and public debate. According to the information obtained, measures based on recommendations given in investigation reports have been implemented to a creditable degree by numerous bodies.

Three serious incident investigations were completed in 2005. The primary cause of the explosive fire at the Tornio steelworks proved difficult to clarify. After exhaustive investigation, three alternative causes for the fire were proposed. A considerable amount of information was attained as a result of the investigation which can be applied in improving the anticipation and preparedness for accidents within industry.

The other two completed investigations were the coach accident at Halikko and the supermarket ceiling collapse at Sysmä. As with the Konginkangas accident, the Halikko accident was a heavy vehicle road traffic accident involving a passenger coach. In the Halikko case, however, the direction taken by the investigation was somewhat different since the incident involved bus traffic only. In addition to the passenger coach investigation, the investigation of the Konginkangas incident involved a general investigation into the safety of heavy vehicles.

The investigation report concerning the collapse of the supermarket ceiling in Sysmä was a continuation of a series of similar building industry investigations in previous years and thus added further weight to the safety recommendations already issued. The causes of the accident were found to be largely the same as for the ceiling collapse at the Pudasjärvi supermarket in 2000. This indicates that deficiencies persist in the repair of known critical details and the flow of information.

At the close of 2005, the investigation which had commenced in March 2005 into the risk of collapse of a shopping centre roof in Kuopio remained uncompleted. The investigation was, however, completed at the beginning of 2006. Conversely, the investigation into the mortar accident which occurred at the beginning of December 2005 remained in the initial stages of investigation.

### Investigations commenced in 2005

Identifier	Date	Title of the investigation
B 1/2005 Y	18.3.2005	Risk of collapse of a shopping centre roof in Kuopio
B 2/2005 Y	27.4.2005	Collapse of the inner ceiling structures of a local supermarket in Sysmä
B 3/2005 Y	2.12.2005	Mortar accident in Rovajärvi army training site

### Investigations completed in 2005

Identifier	Date	Title of the investigation
A 1/2004 Y	19.3.2004	A head-on collision involving a heavy vehicle combination and a charter coach on highway 4 at Konginkangas near the town of Äänekoski ( <i>Abridged translation is published also in English</i> )
A 2/2004 Y	26.12.2004	The natural disaster in Asia ( <i>Published also in Swedish and English</i> )
B 5/2003 Y	19.9.2003	Explosive Fire at Melt Shop in Tornio
B 2/2004 Y	22.12.2004	Sliding of a coach off the road and into a river at Halikko
B 2/2005 Y	27.4.2005	Collapse of the inner ceiling structures of a local supermarket in Sysmä



**A 1/2004 Y**

**A head-on collision involving a heavy vehicle combination and a charter coach on highway 4 at Konginkangas near the town of Äänekoski on 19 March, 2004**

On Friday 19.3.2004 at 02:08, a traffic accident occurred at Konginkangas near the town of Äänekoski on highway<sup>1</sup> number 4. The trailer of a heavy vehicle combination (full trailer combination) on its way from Viitasaari to Helsinki, collided with a charter coach, used by Sunny Buses

<sup>1</sup> Highway = Main Road (Class I)



Ltd (Aurinkobussit Oy), on its way from Helsinki to Kuusamo. The full trailer combination was loaded with paper reels and Transpoint Oy Ab. owned it. There were 36 passengers on the coach at the time of the accident. The driver of the coach and 22 passengers perished in the accident. The rest of the passengers were seriously injured. The driver of the full trailer combination escaped uninjured.

The full trailer combination had left from Helsinki on 18.3.2004 at 20:33 for Viitasaari, loaded with case goods. Another of the same company's full trailer combinations, having departed from Rovaniemi, was loaded in Kemi with paper reels. Both vehicles arrived in Viitasaari during the night of 19.3.2004. The drivers exchanged pallets and trailers, whereafter the vehicles took off from Viitasaari for Helsinki and Rovaniemi, respectively, at about 01:30.

About half an hour after having departed from Viitasaari the vehicle heading towards Helsinki arrived in a place at Konginkangas where the road curves to the left in the driving direction. At this location, there is a northbound overtaking lane. In a downhill curve, about 550 metres before the point of the collision, the trailer of the vehicle began to fishtail (travel with a side-to-side motion) and approximately 150 metres before the point of impact the trailer's rear swung beyond the right hand shoulder of the road into a snow drift down the slope in such a way that the rear wheels were travelling, at most, at a distance of four metres from the edge of the asphalt. The trailer rose back onto the road and the entire vehicle drifted into the left. The driver tried to steer the vehicle back into its own lane, but the trailer continued in the left lane, which was being used by the oncoming coach.

The coach, travelling in its own lane, collided almost head-on with the centre front wall of the trailer. Due to the force of impact, the front part of the coach was crushed. The trailer's detached front wall penetrated nearly halfway into the cabin of the coach, pushed by the trailer's load of paper reels (about 800 kg each).

The full trailer combination continued forward for approximately 25 metres after the collision and the trailer pushed the coach backwards down the slope of the road. The tractor was slowed down by the impact and thrown to the left in the driving direction. Finally, it heavily impacted the left side of the coach. After the impact, the tractor was thrown into the left hand ditch in the driving direction. The trailer, which remained coupled to the truck, stayed on the road next to the coach in the same lane as the coach. According to the tachographs of both vehicles, the full trailer combination and the coach were travelling at approximately 70 km/h at the time of the collision.

The investigation revealed, among other things, that both drivers had valid driver's licences and that neither alcohol nor any other intoxicant was present. The route planning of both vehicles was done in such a manner that it was not possible to complete the trips by following the prescribed speed limits or regulations on driving hours and rest periods. No such technical faults that would have contributed to the cause of the accident were detected in either vehicle. The gross combination weight of the tractor-trailer exceeded the maximum permissible weight by approximately 4 100 kg. The excessive load was not determined to have played a crucial part in the accident.

The road at the accident site was extremely slippery as the surface of the road had frozen after a local rain shower. Both vehicles exceeded the 80 km/h winter speed limit and, taking into account

the slipperiness of the road, travelled at too high situational speeds. The maintenance contractor of the road had not received information about the approaching rain shower.

The investigation commission carried out re-enactive road test runs at the accident site and based on the results, computer simulations were made to establish the causes for the loss of control of the vehicle combination.

The investigation commission determined the causes of the accident by using a methodology that was developed for road and cross-country traffic accident investigation commissions. Direct causal factors were found in the way the full trailer combination and the coach were controlled. Indirect causal factors were found in the vehicles, the traffic situation and factors in the transport system. Additionally, factors contributing to the increase of injuries were found. A total of 32 causal factors were established, of which some were direct and others indirect. The direct cause of the accident, as regards the driver of the full trailer combination, was the loss of control of the vehicle. The selection of an unfavourable driving line, the high situational speed and the driver's possibly reduced state of alertness were the most noticeable contributing factors. The direct cause, regarding the driver of the coach, was the detection error that delayed an evasive manoeuvre. The high speed in slippery conditions was noted as a contributing factor.

When it comes to the full trailer combination, the weak structure of the trailer's body, the insufficient anchoring of the load and the high situational speed of the vehicle contributed to the number of fatal and serious injuries. As for the coach, the low crashworthiness of the front part of the coach, the fact that seat belts were not worn, the high situational speed and the large weight difference between the vehicles were noted as factors causing additional injuries.

The investigation commission made a total of 21 safety recommendations, of which 13 were directed to the Ministry of Transport and Communications. Additional recommendations were made to the Ministry of Trade and Industry, the Ministry of the Interior, the Ministry of Social Affairs and Health, the Ministry of Finance, the Finnish Vehicle Administration AKE, the Emergency Response Centre Administration, the Finnish Road Administration (Finnra) and to the Finnish Bus and Coach Association.

Concerning the improvement of safety of heavy traffic the investigation commission considers the following five recommendations the most important:

The speed limiting devices for lorries shall be set at the vehiclewise maximum speed of 80 km/h.

Legislation should be changed so that, pursuant to the recorded tachograph data, the driver can be penalized for having exceeded the vehiclewise speed limit.

A successfully completed course of anticipatory driving for heavy traffic should be a prerequisite for being allowed to take a driving test for a coach or a vehicle combination licence.

The supervisor (or a supervisory entity) of the driver shall be made legally liable for his role in a possible violation or consequence.



The penalties and other consequences that are imposed for driving hour and rest period violations, working time legislation violations and for exceeding vehiclewise axle and bogie loads and gross vehicle weights should be made more severe. Penalties and consequences should bear real significance to the driver and to the haulier as well as to those in the transport chain who with their own actions, by giving inadequate or incorrect information, by using their right to direct work or by applying other such direct control, have contributed to the arising of an unlawful situation.



**A 2/2004 Y**

**The natural disaster in Asia on 26 December, 2004**

On the morning of December 26, 2004, an exceptionally great earthquake occurred to the north-west of the island of Sumatra, which forms part of Indonesia. The earthquake caused a rupture in the earth's crust some 1 200 km long and spawned a tidal wave or tsunami of immense proportions. The tsunami caused widespread devastation particularly on the coasts of Sumatra, Thailand, Sri Lanka and India; about 300 000 people were killed or lost. 179 Finnish citizens were among the dead and 250 were injured. Of the Finns who died, 170 were staying in Khao Lak in Thailand, 106 of them at the same hotel.

Pursuant to section 3 of the Accident Investigation Act (373/1985), the event was classified as a disaster. On 13.1.2005, the Finnish Government appointed an Accident Investigation Commission pursuant to section 1 of the Act.

The earthquake occurred at about 08.00 Thailand time. The tsunami hit the province of Aceh at the northern tip of Sumatra at about 08.30, the west coast of Thailand at about 10.00 and Sri Lanka about one hour later. The tsunami came as a complete surprise to both local residents and tourists. Most of the Finns who died or were injured were staying in Thailand, which is why the investigation was initially focused there. Local residents immediately initiated aid measures and the authorities became involved about one hour after the event. The hospitals in the Phuket and Takuapa areas were overloaded as hundreds of patients were brought in at one time, and so, transfers of the injured to hospitals in the Bangkok area began. The evacuation of Finns, on charter flights, was started at the initiative of Finnish travel agencies in the evening of 26 December. The Finnish authorities got involved on the morning of 27.12., at which point it was decided that all Finns in the region would be evacuated at the government's expense, if necessary. Government-commissioned evacuation flights began in the evening of 27.12. and ended on 2.1.2005.

Some 3 300 people were brought back to Finland on these flights; an additional 400 people returned home on commercial flights. Flying out to the disaster area, the chartered planes carried mainly medical personnel from the Finnish Red Cross, other relief personnel, members of the Finnish Police disaster victim identification team and relief aid supplies. Injured persons returning to Finland were admitted to central hospitals. Psychosocial assistance was provided for those requiring it and various services were set up for families and relatives. The repatriated dead were given a solemn reception at Helsinki-Vantaa Airport.

The investigation involved examination of the origin and impact of the natural disaster, the course of events from the point of view of Finns, the actions of the authorities, companies, organizations and communities, the repatriation and evacuation flights, the rescue operation and treatment of the injured and the command system and communications in Finland. Two trips were made to Thailand in order to study local circumstances and the functioning of the rescue, evacuation and health care system. It was established during the course of the investigation that the Finnish authorities are not adequately equipped to take immediate action to help Finnish citizens involved in a serious accident abroad. Once action was initiated, it got efficiently up to speed in a couple of days. Personnel voluntarily performed above and beyond the call of duty, to the brink of exhaustion. Operational leadership was assigned to the Coordination Board of Government Chiefs of Preparedness, a.k.a. as the meeting of heads of preparedness, chaired by the State Secretary, Prime Minister's Office. The competent authority was the Ministry for Foreign Affairs, and an official from the Ministry was in charge of the evacuation operation. All Finns were evacuated from the area in seven days. Public communications by the authorities was less than successful. The Information Unit at the Ministry for Foreign Affairs restricted itself to official bulletins; these conflicted with the information available to the general public and published by the media, and the latter were subsequently proven correct. This resulted in loss of confidence in official communications, which could not be dispelled during the critical first week. The investigation showed that most of the media did rely on official information in addition to the news services during the first few days following the disaster, but once the official information had been proven incorrect, the media changed their tack.

Being an act of nature, the disaster could not have been avoided. No early warning or alert system existed. Once the tsunami had hit the coast, there was nothing at all that the Finnish authorities could have done to save any of the Finns who perished or disappeared in the disaster. Neither the local residents nor the tourists were aware of or could prepare for the tsunami. Tour operators and hotels were likewise unprepared, and there was no provision for evacuation and medical care facilities to cope with a disaster of this magnitude. Thailand's extensive readiness organization, which extends to the local village level, enabled rapid initiation of relief activities. The Thai military was immediately tasked to participate in the rescue operation. Other countries also sent professional and well-equipped help to the disaster area at short notice.

In Finland, travel agencies, airlines and the Finnish Red Cross had the capacity to initiate aid measures rapidly. However, not all of the available medical, rescue or airline capacity was used. Shortcomings in crisis readiness were revealed in the functioning of the authorities, particularly of the Ministry for Foreign Affairs, including neglecting to address shortcomings that had already been identified earlier. A lack of inter-authority readiness measures and joint operation capacity appeared to be the main cause for this. Also, the authorities did not have sufficient information on companies and other actors capable of providing aid in such a situation. This demonstrated a lack

of ability to make use of lessons learned from exercises aimed at improving joint operations between various actors.



**B 5/2003 Y**

**Explosive fire at melt shop in Tornio on 19 September, 2003**

The stainless steel manufacturing melt shop in Tornio is part of AvestaPolarit Stainless (Outokumpu Stainless as of January 12, 2004). The melt shop line number 2 that had been built the previous year was in its first annual maintenance stoppage. During the stoppage back pressure valves were to be installed to pipelines conveying the so called raw oxygen and pure oxygen. Therefore they had been closed and made gasfree. Most of the work had already been completed, and the foreman of the factory and the foreman of the subcontractor started preparing the start-up of the oxygen systems.

The men entered the valve room in the third floor of the smelting house, where they successfully opened the main shut valve of the raw oxygen line. Thereafter they started opening the main shut valve of the oxygen line. The valve was apparently stuck, because the bolt pin holding the hand wheel in the valve stem snapped. The men asked for pipe tongs, with the help of which they started turning the valve hand wheel stem. They managed to turn the stem about one turn, corresponding to a 9° turn of the disc. At that moment an explosive fire broke out. It kept burning strong as the oxygen was leaking from the damaged piping. Both the foremen that had been opening the valve and a welder who had come to the scene just before the accident were killed.

Judging by the burn marks the fire started from the oxygen line main shut valve; a butterfly valve with a nominal diameter of 300 mm. Gaseous oxygen compressed to a pressure of 35 bar was flowing in the pipes. There was a by-pass line beside the valve. Due to safety reasons this line was supposed to be used to equalise the pressure on both sides of the main shut valve before opening the latter. After the accident the by-pass valve was found to be in a closed position, although no certain information about the use of the by-pass line was found in the investigation. Whether or not the by-pass line was used will have affected the cause of the fire.

During the investigation ten basic causes for fire were looked into. In this case the only possible reasons seem to be friction and particle impact. On the basis of the investigation the fire may have ignited in three different ways. 1. The slide bearings of the valve disc stem may have been

damaged, and two steel surfaces may have come into contact in the damaged area. When the valve was being opened, these two seized surfaces may have become hot and set fire on the bearing material which ignites more easily than steel. 2. The valve may have been opened ajar without equalising the pressure. In this case the particles in the fast oxygen flow of the valve gap would have struck valve parts, become hot, and ignited the valve to burn in the oxygen. 3. A foreign object may have gotten stuck in the valve and formed a friction pair that enabled friction heating when the valve was being opened. The third option is possible even though the by-pass line had been used, but the first two necessitate the opening of the valve without equalising the pressure.

In order to avoid any similar accidents the Investigation Commission recommends that dangerous work assignments be identified and instructions for carrying them out be compiled. Potentially dangerous malfunction, fault, and abnormality situations should similarly be defined and detailed instructions to deal with them should be drawn up. Abnormal situations that have occurred should also be registered. The board of investigation further recommends that EU directives should require the valve manufacturers to compile instructions concerning the usability of valves with different gases. Among other things, the instructions should take into consideration the circumstances and purpose of use. In order to guarantee the cleanness of oxygen lines the investigation commission recommends that a plan and instructions should be drawn up for ensuring the sufficient cleanness of the piping. Furthermore, any valves connected with dangerous operations should be included in the preventive maintenance systems of the companies.



#### **B 2/2004 Y**

#### **Sliding of a coach off the road and into a river at Halikko, Southwest Finland on 22 December, 2004**

The express coach, operating on the Helsinki–Turku route via the town of Salo, left Helsinki at 20.00 hrs on 22 December 2004. The coach's last stop was at Salo, from where it continued its journey at 21.53. At Halikko, a distance of eight kilometres from Salo, the road begins an 800 metre long downward stretch. Half way down the slope the driver and passengers felt a gust of wind lurch the coach to the right. The driver lost control of the vehicle, which ran off the road, first colliding into the roadside railing and then toppling onto its side and coming to rest in a river. One passenger who was sat on the front row died. Six other passengers were seriously injured and a further nine passengers received minor injuries. Seven passengers survived without injury. The time of the accident was 22.05.



All of the injured managed to escape the vehicle either by their own efforts or with the help of others to await the rescue services. The passengers' escape from the vehicle was assisted by the fact that the coach interior remained lit and that the driver and all of the passengers, with the exception of the casualty caught beneath the coach, were mobile. Rescue and ambulance services arrived at the scene 11–16 minutes after the call was issued. The rescue crew began an assessment of the coach interior and the vicinity of the accident and carried out a search along the river bank. The ambulance crews began to assess the casualties held in the ambulances, most of whom were drenched from the river. Some of the casualties were taken to the Salo Regional Hospital and to the Salo Health Centre Emergency Unit and others to Turku University Central Hospital.

At the time of the accident, driving conditions were extremely poor as the road surface was slippery due to slush. Rain had begun to turn to moderate sleet and snowfall about half an hour before the accident and increased to heavy sleet/snowfall immediately prior to the accident. The wind was strong and exceptionally gusty. The wind speed is estimated to have been 17–18 m/s, reaching gusts of about 30 m/s. The force of the storm on the day in question was classified as exceptional. The accident occurred at an exposed location at which the southerly wind was practically unobstructed.

The immediate cause of the accident was that the extent of side thrust resulting from the wind exceeded the frictional force at the front wheels and the driver subsequently lost control of the vehicle. The powerful side thrust was the consequence of the high velocity of the side wind, the shape of the coach, the large surface area of the side of the vehicle, and the driving speed. The negligible frictional force at the front wheels was caused by the weighing of the mass of the coach predominantly on the rear axles as well as by the poor frictional properties in the prevailing conditions, which were further exacerbated by reasonably worn tyres of a type primarily designed for summer use. The tyre treads proved incapable of sufficiently displacing the slush from the road surface, resulting in skidding of the wheels. Skidding was further facilitated by the fairly high driving speed with respect to the amount of slush present on the road.

With the purpose of avoiding similar accidents, the investigation commission recommends that norms to be drawn up for the bus and coach industry stating the standard safety practices applicable to bus and coach traffic and providing the necessary preconditions for continuous development of safety measures. The investigation commission also recommends testing to be carried out of the tyres of heavy vehicles with a view to acquiring information on optimal tyre models for winter motoring. Bus and coach traffic safety could be further improved if bus and coach operators and drivers were provided with, and made use of, real-time information about the driving conditions on their own particular driving route during periods of poor weather.



**B 2/2005 Y**

**Collapse of the inner ceiling structures of a local supermarket in Sysmä on 27 April, 2005**

On Wednesday 27.4.2005 at 9.29, half of Sysmä S-Market's inner ceiling structure collapsed. The collapse took approximately 10 seconds. During the accident there were 25 people in the building, nine of whom were in the damaged 400-square-metre area. Nobody was injured in the accident.

The inner ceiling had to be renewed. Lighting fixtures, installation bars and cables, cooling equipment pipes, air ducts, and damaged fixtures underneath were also renewed. The part of the inner ceiling that did not collapse was reinforced. Total costs caused by the accident were approximately 270 000 euros. The local co-operative company had the inner ceilings of all their shops and restaurants inspected and the necessary repairs were made.

The cause of this accident was the nail joints that joined the inner ceiling battens to the roof trusses. These joints were not strong enough. The joints had mostly two nails nailed with a compressed air nail gun. The load capacity of the nails was not adequate for the weight of the inner ceiling and the masses attached to it.

The nail joint details had not been designed in 1997 when the building was built. The loads were not evaluated and the load capacity of this type of joint was not ensured. The drawings did not indicate how the joint should be made. For this reason, the contractor used a method that was familiar and used before.

The investigation board does not give safety recommendations, because the investigation report as such gives information on how to avoid similar accidents in the future. The technical causes of this accident are clear, and several improvements have been made since the building was built in 1997. Recommendations for improving ceiling structure safety have been given in previous investigation reports by the Accident Investigation Board. A detailed investigation of a similar matter is reported in investigation report B 1/2000 Y Collapsing of Ceiling of Supermarket at Pudasjärvi on 27 December, 2000. In that accident, the structure and the causes were mostly the same as in this accident in Sysmä.



The Ministry of the Environment has started several projects to improve safety after this building was built. Many organisations and companies working in the construction industry have participated in the projects. Practical measures among other things have been the new detailed Land Use and Building Act, researching extracting forces of nails, setting up a co-operation group for those operating in the building industry, appointing a co-ordinator, monitoring improvements in safety, and several letters to municipal building inspectors.

The investigation board wishes to remind the construction industry that safety must be a permanent part of work for everyone working in the industry.

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

### Recommendations

Of the five investigations completed in 2005, the Sysmä roof collapse investigation was the only report not to issue any new safety recommendations. In the four other completed investigations a total of 48 recommendations were issued.

On the basis of the investigation of the **South-East Asian natural catastrophe**, a total of 27 recommendations were issued regarding the following:

- management of public administration, the government, several ministries jointly	7 recommendations
- Ministry for Foreign Affairs	5 recommendations
- Ministry of the Interior	4 recommendations
- Ministry of Social Affairs and Health	6 recommendations
- Ministry of Trade and Industry	11 recommendations
- Ministry of Transport and Communications	12 recommendations

On the basis of the **Konginkangas serious accident** investigation, 17 recommendations were given. Of these, ten were submitted to the Ministry of Transport and Communications, one to the Ministry of the Interior, one to the Ministry of Trade and Industry, one to the Road Administration, one to State Provincial Offices, one to the Emergency Response Centre Administration and one to the Ministry of Trade and Industry. Furthermore, one recommendation was issued jointly to hospital districts and health centres and one jointly to the Finnish Transport Operators Association and transport contractors.

The investigation of the **explosive fire at the melt shop in Tornio** issued six recommendations, of which three were issued to the Safety Technology Authority, one to the Ministry of Trade and Industry and one of which was issued directly to the steelworks in question and jointly to the industrial safety authorities and Safety Technology Authority.

On the basis of the **coach accident in Halikko**, three recommendations were made, all of which were issued to the Ministry of Transport and Communications. One recommendation named the Finnish Transport Operators Association in addition to the Ministry of Transport and Communications as the implementer organisation. In another, the Finnish Meteorological Institute, the Road

Administration and the bus and coach industry in general were named. Other observations were also highlighted in connection with the recommendations and relevant safety proposals issued.

**Recommendation implementation monitoring** commenced towards the end of 2004 and continued in 2005. Of the 72 recommendations issued during the years 2000–2003, the implementation status of 60 recommendations has been investigated by means of follow-up letters. The results of the monitoring process are not yet available since the monitoring process is still in progress. Monitoring will be continued in 2006.

## Other accident investigations in 2001–2005

### 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	The natural disaster in Asia on December 26, 2004	2005
A 1/2004 Y	A head-on collision involving a heavy vehicle combination and a charter coach on highway 4 at Konginkangas near the town of Äänekoski on March 19, 2004	2005

### Accidents and serious incidents

An Investigation Commission is appointed by the Accident Investigation Board.

Identifier	Title of the investigation	Published
B 3/2005 Y	Mortar accident in Rovajärvi army training site on 2 December, 2005	-
B 2/2005 Y	Collapse of the inner ceiling structures of a local supermarket in Sysmä on 27 April, 2005	2005
B 1/2005 Y	Risk of collapse of a shopping centre roof in Kuopio on 18 March, 2005	-
B 2/2004 Y	Sliding of a coach off the road and into a river at Halikko on 22 December, 2004	2005
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





### 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

Government office financing of the Accident Investigation Board of Finland is based on state budget allocations under the main division of the Ministry of Justice, as specified in Paragraph 22 *Operational expenditure of government offices*. Expenses incurred through accident investigation activities which are compliant with the Act on Accident Investigation (1985/373) are included under the appropriation estimate, "Special expenditure," stated in Paragraph 29. The Accident Investigation Board of Finland conducts no chargeable operations.

The size of budget allocations to the Accident Investigation Board of Finland has remained the same since the year 2000. Increases have mainly covered rises in salaries and overhead expenses. The 2005 allocation was 865,000 euros plus 6,153.86 euros carried over from 2004, totalling 871,153.86 euros. The share of labour costs was 616,635 euros and leases 92,933 euros. The cost structure has remained broadly the same each year. 24,635 euros from the 2005 allocation was transferred to the year 2006.

The size of the appropriation estimate allocated for investigation in the 2005 budget was 500,000 euros. Additional appropriations were granted twice in 2005. The first was granted at 700,000 euros, the second at 150,000 euros. The total use of estimated appropriations in 2005 was 1,333,951 euros. Total expenditure in 2004 was 1,250,585 euros.

The estimated appropriation level has been undervalued in the state budget for a number of years. The need for additional appropriations in 2005 was predominantly due to the investigation of two notable serious accident cases. The required estimated appropriation level for category C investigations is difficult to estimate and predict as its use depends both on the number of accidents investigated and on the nature of the incidents. In 2005 the cost of individual investigations varied in scale from hundreds of euros to 400,000 euros.

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 following table.



Expenditure of the Accident Investigation Board and its accident investigation activities in 2001–2005. (financial statement data).

<b>Year</b>	<b>Accident investigation board</b>	<b>Investigation allocation</b>	<b>Total</b>
<b>2001</b>	759 422 euros	867 830 euros	1 627 252 euros
<b>2002</b>	780 007 euros	826 375 euros	1 606 382 euros
<b>2003</b>	792 448 euros	1 270 330 euros	2 062 778 euros
<b>2004</b>	831 798 euros	1 250 585 euros	2 082 383 euros
<b>2005</b>	846 519 euros	1 333 951 euros	2 180 470 euros

Allocations of Accident investigation board in 2005.

Salaries	616 635 euros
Rents	92 933 euros
Other expences	161 586 euros
<b>Total</b>	<b>871 154 euros</b>