



Investigation report

C 24/1998 L

Risk of collision between two airliners southwest of Vihti VOR, Finland on 9 October 1998

Translation of the original report in Finnish

OO-DHW, B727-223F

OY-KHR, DC-9-81 (MD-81)

According to Annex 13 of the Civil Aviation Convention, paragraph 3.1, the purpose of aircraft accident and incident investigation is the prevention of accidents. It is not the purpose of aircraft accident investigation or the investigation report to apportion blame or to assign responsibility. This basic rule is also contained in the Investigation of Accidents Act, 3 May 1985 (375/85) and European Union Directive 94/56/EC. Use of the report for reasons other than improvement of safety should be avoided.



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APPENDICES

Transcripts of relevant radio communications and telephone conversations.

Other investigation material is stored at the Accident Investigation Board, Finland.



SYNOPSIS

On Friday 9 October 1998, at 22.51 local time, an air traffic incident occurred about 50 NM west of Helsinki at an altitude of 6250 metres. The incident involved a DC-9-81 (MD-81) airliner, call sign SAS 714, which was operated by Scandinavian Airlines System on a scheduled flight from Copenhagen to Helsinki, and a B727-223F airliner, call sign BCS 6514, which was on a cargo flight from Helsinki to Gatwick operated by European Air Transport. The aircraft were on intersecting flight paths and eventually passed each other so that the required minimum separation was broken.

Tampere area control centre reported the incident on 9 October 1998, by filling in the Finnish CAA's form ILL/3626, "Report on a hazard to flight safety". Neither of the crews is known to have filed an incident report.

The Accident Investigation Board (AIB), Finland commenced an investigation (C 24/1998 L) on 16 October 1998. Air traffic controller Mr. Pertti Haimi was appointed to investigate the incident and airline transport pilot Mr. Pentti Niemi was consulted during the investigation. The investigation was closed on 15 February 2000.



ABBREVIATIONS

ACC	Area control centre, area control
AIP	Aeronautical Information Publication, Finland
APP	Approach control office, approach control, approach control services
ATC	Air traffic control (in general)
CVR	Cockpit voice recorder
DME	Distance measuring equipment
EFES	Air Navigation Services Center for Southern Finland
EFHK	Helsinki-Vantaa airport
FDR	Flight data recorder
FL	Flight level
FT, ft	Feet (dimensional unit)
hPa	Hectopascal
h	Hour
IFR	Instrument flight rules
kt	Knot
MHz	Megahertz
MSL	Mean sea level
nm	Nautical mile
QNH	Altimeter sub-scale setting to obtain elevation when on ground
UTC	Co-ordinated universal time
VOR/DME	VHF omnidirectional radio range / distance measuring equipment



1 FACTUAL INFORMATION

1.1 Sequence of events

The name of airway V3/UV3 was removed from the Aeronautical Information Publication (AIP), Finland on 8 October 1998 at 00.00 UTC. The airway was changed into an RNAV route and renamed as P/UP606. An AIP amendment on the subject was issued on 27 August 1998, with a remark: *"This AIP Amendment shall not be entered in the AIP prior to its effective date of 8 October 1998"*.

The Belgian European Air Transport BCS 6514 had a current flight plan, which had been filed on 9 October 1998 at 18.55 UTC. The departure time from Helsinki had been entered as 19.40 UTC and the cruise level as FL 310. The route went straight to SUNNA reporting point, then on airway UL990 to reporting point LAGIS and further to Gatwick in accordance with the flight plan. However, Tampere area control centre had changed the route so that it would lead to reporting point MILKA and thereafter on airway UP606 to reporting point KOSKA. The route had been corrected in the computer used for relaying flight plan data. The change had also been correctly marked on flight progress strips. Moreover, Tampere area control centre (ACC) and Helsinki approach control (APP) had the following telephone conversation on the subject (*the conversation was in Finnish and has been translated for the purpose of this report*):

19.02.40 ACC: Area
 APP: Hello
 ACC: Area
 APP: Well, I didn't call – someone else called.
 ACC: Oh – someone called you from here – listen, about Eurotrans 6514.
 APP: Wait a minute, six – 6514 – should I have that?
 ACC: Yes – it's in taxi now and has been changed to MILKA – MILKA KOSKA.
 APP: MILKA KOSKA.
 ACC: So it was PINJA SUA and then to KOSKA, and now MILKA KOSKA has been changed here.
 APP: All right.
 19.03.20 ACC: Okay.

Helsinki ground control, which takes care of ground traffic and also relays route clearances to aircraft while Helsinki delivery is closed, reported a new calculated takeoff time to BCS 6514. It acknowledged the new time and requested for start-up. The ground control gave BCS 6514 a permission to start up and issued a route clearance. At first, BCS 6514 read the airway clearance back incorrectly. When the crew was asked to confirm the route clearance as to the airway used, they read back the airway information correctly, too. The radio communications were as follows:

19.29.20 GND: Eurotrans 6514 Ground.



BCS Go ahead.
GND: New calculated takeoff time 37, correct time 29 and half .
BCS: New takeoff time 37 – 1937 and the actual time is copied and request start-up 6514.
GND: Start-up approved – cleared to destination Echo Golf Golf Whiskey, MILKA 4 Echo departure, Upper Papa 606, squawk 2051.
BCS: Eurotrans 6514 is cleared to start-up, destination EGGW, Upper 406 and 2051.
GND: Confirm after MILKA airway Upper Papa 606.
BCS: Upper Papa 606 Eurotrans 6514.
GND: That is correct.

SAS 714 initially contacted Tampere area control centre at 19.31.00. It was informed of radar contact and cleared for arrival route NAKKI 1 Sierra to runway 15, via the reporting points of KOSKA, PEVEN and ETTAN. Later on, SAS 714 was cleared to descend to FL 150. The radio communications were as follows:

19.31.00 SAS: Tampere good evening Scandinavian 714, maintaining flight level 330.
ACC: Good evening Scandinavian 714 Tampere, radar contact, NAKKI 1 Sierra, runway 15.
SAS: VIHTI arrival for runway 15, confirm.
ACC: Negative, November Alfa Kilo 1 Sierra, runway 15 via KOSKA PEVEN ETTAN.
SAS: Runway 15 and KOSKA PEVEN ETTAN, Scandinavian 714.

Tampere area control centre was manned as usual during the night shift, by four air traffic controllers and two assistants. All of them were working as scheduled on the shift list. Sectors 1 - 5 had been combined so that air traffic was controlled in a single sector. The radar screen thus showed the whole of Southern Finland, including parts of the neighbouring countries and of the Northern flight information region (FIR). It was Friday and the controllers told that the traffic was relatively heavy before midnight. At the time of the incident, there were eleven aircraft on radar display. One aircraft located at the north-eastern corner of the area was under active radar vectoring.

BCS 6514 took off from Helsinki-Vantaa runway 22 at 19.40, using the standard instrument departure MILKA 4 Echo. When passing through 1700 feet, it contacted the COR controller at the approach control. The controller first instructed BCS 6514 to maintain FL 70, and after a while cleared it to FL 80 and further to FL 100. When BCS 6514 reported reaching FL 100, the radar controller gave it a clearance to climb to FL 250 and transferred the control and radio contact over to Tampere ACC.

BCS 6514 initially contacted Tampere ACC at 19.47.50, reporting that it was approaching MILKA and passing through FL 145 cleared to FL 250. Tampere ACC reported that radar contact was established and cleared the aircraft to continue climb to FL 310, which was the cruising level requested by BCS 6514. After passing MILKA reporting point, BCS 6514 turned right towards SUNNA VOR/DME beacon, although it



should have continued towards reporting point KOSKA along the airway UP606 as shown on the flight progress strips and computer routing.

The controller working at ACC radar workstation R1 was reviewing the traffic situation with the shift supervisor, preparing for a change of duties. At that time, the controller at workstation R2 noticed the traffic conflict, pointed at the conflict location with a pen, and said (in Finnish): *"Hey, look where that's going"*. The controller at R1 ordered BCS 6514 to stop its climb immediately, and SAS 714 to stop its descend immediately. Both crews followed the instructions, switched on the floodlights and reported having the traffic in sight. However, after stopping the climb and descent, both aircraft remained at the same flight level as shown in the radar altitude data. The radar controller then ordered BCS 6514 to descend immediately. The crew followed the instruction and, ten seconds later, reported having crossed the opposite traffic. The radio communications were as follows:

- 19.51.00 ACC: Eurotrans 6514, stop your climb immediately, I say again stop your climb immediately, Scandinavian 714, stop your descend immediately, I say again stop your descend immediately.
 SAS: Scandinavian 714, we have the traffic in sight.
- 19.51.20 BCS: Got the traffic in sight, Eurotrans 6514.
 ACC: 6514, descend immediately, I say again descend immediately.
- 19.51.40 BCS: Eurotrans 6514, we crossed the opposite traffic.
- 19.51.50 BCS: Tampere did you got it.
- 19.52.00 ACC: 6514 copied and now turn left 350 äää 35 degrees.
 BCS: Turning left 35 degrees, new heading 305, Eurotrans 6514.
 ACC: Scandinavian 714, you are clear of opposite traffic, continue descend 150, contact Helsinki radar 119,1.
 SAS: 119,1 descending flight level again, Scandinavian 714.

After the incident, the ACC radar controller instructed BCS 6514 to its assigned route, clearing it to reporting point KOSKA and back to its en-route flight level 310.

1.2 Basic information

1.2.1 Aircraft

BCS 6514, BOEING 727-223F, registration OO-DHW, owner European Air Transport.

SAS 714, DC-9-81 (MD81), registration OY-KHR, owner Scandinavian Airlines System.

1.2.2 Type of operation

BCS 6514 was on a cargo flight from Helsinki to Gatwick. SAS 714 was on a scheduled passenger flight from Copenhagen to Helsinki.



1.2.3 Persons on board

BCS 6514 had a crew of three. SAS 714 had 106 passengers and five crewmembers on board.

1.2.4 Crews

Both flight crews and the air traffic controllers had valid licences and ratings.

1.2.5 Weather

There were scattered cirrus clouds at the height where the incident occurred, and the wind was about 40 knots from west. Medium and low clouds were found at lower heights. Visibility was good despite the darkness.

1.3 Investigations

1.3.1 Incident site

The incident occurred in class A airspace between flight levels 200 and 210, within Tampere flight information region, five miles west-southwest of reporting point ETTAN.

1.3.2 Instructions and documentation

Coordination of duties between Tampere area control centre and Helsinki-Vantaa approach control is based on procedures defined in the Finnish Air Traffic Controller's Handbook. Moreover, the co-operation is governed by a Letter of Agreement between these two ATC units.

1.3.3 Navigation aids, radio equipment and radars

All navigation aids, radio equipment and radars were operating normally.

1.3.4 Radio, telephone and radar data recordings

The investigation was based on recordings of radio communications and telephone conversations from Helsinki-Vantaa ground, aerodrome and approach control, and from Tampere ACC. In addition, radar data recordings from Tampere ACC and graphics from Helsinki-Vantaa noise monitoring system were used.



1.3.5 Flight recorders and incident reports

Flight data recorders and cockpit voice recorders were not read out.

Tampere area control centre reported the incident on the same day by filling in the form ILL/3626, 11.97, "Report on a hazard to flight safety". The report was supplemented by four separate appendices, in which four controllers and an ATC assistant described the incident and its circumstances, as seen from Tampere ACC's point of view.

The following entry was made in the ATC log (in Finnish): *"Air traffic incident near ETTAN. Scandinavian 714 PEVEN-U/T6-HEL, Eurotrans 6514 MILKA-U/P606 KOSKA turned towards SUNNA after MILKA. The aircraft passed closely. See incident report."*

On 10 October 1998, the Deputy Manager of Tampere ACC made a preliminary analysis of the incident, as required by the internal quality assurance system of the Finnish Civil Aviation Administration. The analysis was entitled *"Rapid analysis on a loss of separation in airspace between MILKA and ETTAN"* (*Pika-analyysi porrastusminimin alituksesta MILKA-ETTAN välisessä ilmatilassa*).

When requested by the investigators, SAS 714 pilots gave their description of the incident on 20 November 1998.

The captain of BCS 6514 gave his own description of the incident on 22 November 1998, also at the investigators' request.



2 ANALYSIS

2.1 Events before the incident

DHL called the BCS 6514 crew at the hotel at about 13.00 UTC and asked them to fly a flight Helsinki-Heathrow-Brussels. Departure time from Helsinki was planned as 17.40 UTC. Having arrived to the aircraft, the crew learned that the slot time was two hours late and the flight might be rerouted. The crew received six separate flight plans between 17.00 and the departure time (19.40 UTC). The flight plans were for three different call signs and two different destinations, Luton and Heathrow. The previous flight plans were cancelled every time a new one was received.

As the flight plan was contrary to the current traffic flows (runway 22 was used for takeoffs and runway 15 for landings), BCS 6514 route was changed on the computer used for processing flight plan data. The change was confirmed by a phone call, as required by the Letter of Agreement between Tampere area control centre and Helsinki-Vantaa ATC. Helsinki Ground relayed the new route clearance to the aircraft.

When the controller gave the amended route clearance to BCS 6514, he could have used the word "rerouted" to make the message more clear, but he did not do so.

If the controller had mentioned the reporting point KOSKA after the standard instrument departure MILKA 4 Echo, the clearance would have been even easier to understand.

2.2 Events leading to the incident

The incident occurred when BCS 6514, after following the MILKA 4 Echo standard instrument departure route, did not continue along airway UP606 as indicated in the route clearance received and acknowledged by the crew. Instead, the aircraft turned right towards VOR/DME SUNNA, cleared to its cruising level FL 310.

At the same time, SAS 714 was approaching Helsinki along the route KOSKA PEVEN ETTAN, cleared to FL 150 in accordance with the Letter of Agreement.

The aircraft passed each other on intersecting flight paths, by a horizontal distance of about 1 km and a vertical distance of 400 ft, so that the required minimum separation was lost. The incident occurred 50 NM west of Helsinki at an altitude of 6250 m.

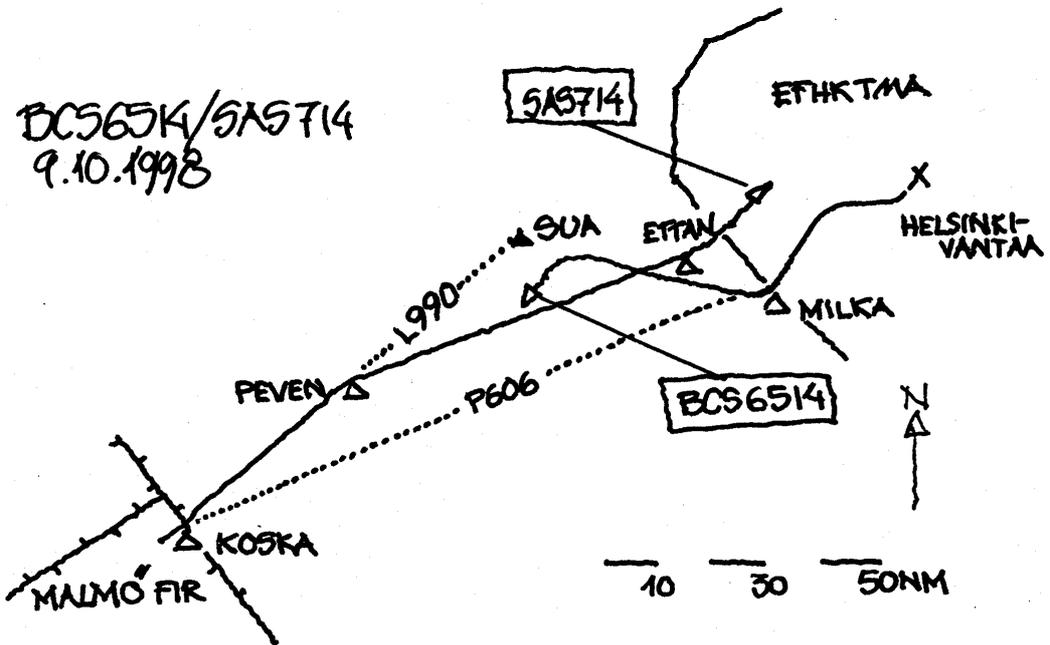


Figure 1. The flight paths and flight altitudes of the aircraft intersected at the same point on airway T6.

TUTKAN KORKEUSTIETO KOHTAUSTILANTEESTA
(PIIRRETTY VIDEOTALLENTTEESTA)

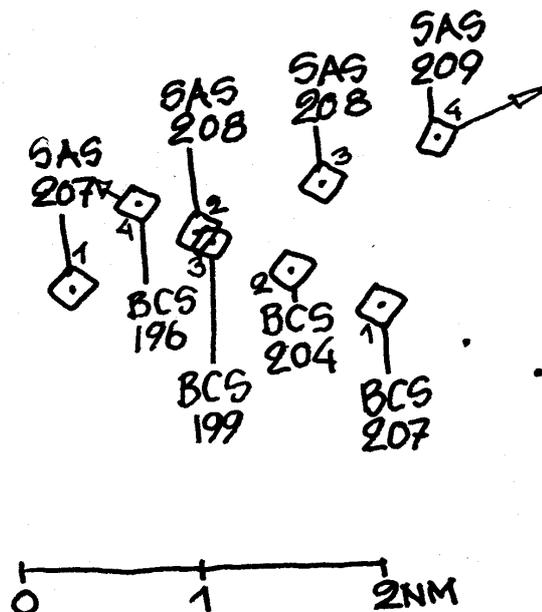


Figure 2. Radar altitude information at the time of intersection.



3 CONCLUSIONS

3.1 Findings

1. The flight crews and air traffic controllers had valid licences and ratings as required for their duties.
2. The names of the airways had been changed two days before the incident.
3. BCS 6514 did not comply with its amended route clearance, but flew in accordance with the original flight plan.
4. Having noticed the traffic conflict, ACC radar controller ordered BCS 6514 to stop its climb and SAS 714 to stop its descent immediately.
5. After realizing that the two aircraft remained at the same flight level despite having followed his previous instruction, the controller ordered BCS 6514 to descend immediately.
6. The crews switched on the floodlights and saw the other aircraft from far.
7. Neither aircraft made an avoiding manoeuvre.
8. The aircraft passed each other by a horizontal distance of about 1 km and a vertical distance of about 400 feet.
9. When giving the amended route clearance to BCS 6514, the controller could have used the word "rerouted" to make the message more clear. However, he did not do so.
10. If the controller had mentioned the reporting point KOSKA after the standard instrument departure MILKA 4 Echo, the clearance for BCS 6514 would have been even easier to understand.
11. SAS 714 flew in accordance with its clearance.

3.2 Probable cause

BCS 6514 did not comply with the clearance received and acknowledged by the crew.



4 RECOMMENDATIONS

No recommendations are issued.

Helsinki 15.02.2000

Pertti Haimi

INVESTIGATION MATERIAL

The following investigation material is stored at the AIB, Finland.

1. Decision no. C 24/1998L, about opening the investigation.
2. Transcripts of relevant radio communications and telephone conversations, plus 4 cassettes.
3. Recording of Tampere ACC radar image (video tape).
4. Flight plans, flight progress strips.
5. Route charts, old 23 April 1998, new 8 October 1998, EFHK SID, STAR as applicable, AIP AMDT No. 16, dated 8 October 1998.
6. Incident report, four appendices and preliminary analysis.
7. Pilots' descriptions of the incident, computer flight plan of Eurotrans 6514.
8. Air Route Bulletin EFHK - EGLL, SWC chart, wind information.
9. EFES shift lists, extract of ATC log for the night shift, EFES - EFHK Letter of Agreement.
10. Graphics from Helsinki-Vantaa noise monitoring system.
11. Miscellaneous notes on the subject.