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Swiss Accident Investigation Board SAIB

Aviation Division

Final Report No. 2134 by the Swiss Accident Investigation Board SAIB

concerning the serious incident involving a B737-800 aircraft, registration D-AHLR

on 7 June 2009

65 NM on radial 135° of the GVA (Geneva) VOR

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Cause

L'incident grave est dû à de l'émanation de fumée consécutive à un court-circuit provoqué par un défaut d'assemblage d'un circuit imprimé d'un boîtier audio (SEB) placé sous un siège passager d'un avion de ligne.

General information on this report

This report contains the Swiss Accident Investigation Board's (SAIB) conclusions on the circumstances and causes of the serious incident which is the subject of the investigation.

In accordance with Art 3.1 of the 10th edition, applicable from 18th November 2010, of Annex 13 to the Convention on International Civil Aviation of 7 December 1944 and Article 24 of the Federal Air Navigation Act, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent accidents or serious incidents. The legal assessment of accident/incident causes and circumstances is expressly no concern of the accident investigation. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability.

If this report is used for purposes other than accident prevention, due consideration shall be given to this circumstance.

The definitive version of this report is the original in the French language.

All times in this report, unless otherwise indicated, are stated in local time (LT). At the time of the accident, Central European Summer Time (CEST) applied as local time in Switzerland. The relation between LT, CEST and UTC is: LT = CEST = UTC + 2 hours

Table of contents

Final report

Introduction

Owner	NBB-Germany Lease Partnership, Tokyo 103, Japan
Operator	Hapag-Lloyd Fluggesellschaft mbH, 30855 Langenhagen, Germany
Manufacturer	Boeing Commercial Airplane Group, Seattle/Washington, USA
Aircraft type	Boeing 737-800
Country of registration	Germany
Registration	D-AHLR
Location	65 NM on radial 135° of the GVA VOR, in Italian airspace delegated to Switzerland
Date and time	7 June 2009, 14:31 UTC

Investigation

The incident occurred at 14:31 UTC. It was notified at 16:50 LT to the Aircraft Accident Investigation Bureau (AAIB), which proceeded to open an investigation.

The AAIB notified the German, Italian and American authorities of the incident. Germany and Italy nominated an accredited representative.

The final report is published by the Swiss Accident Investigation Board (SAIB).

Synopsis

On 7 June 2009 at 14:31 UTC, the crew of the Boeing 737-800 aircraft, registration D-AHLR, making a charter flight from Mahon (LEMH) destination Frankfurt (EDDF) made a MAYDAY distress call on the Swiss Radar 128.155 MHz frequency, reporting a fire of electrical origin on board and their intention to divert to Geneva.

At 14:41 UTC, the crew reported that the fire in the cabin was under control.

At 14:55 UTC, the aircraft, with 197 passengers including 9 infants plus 6 crew members on board, landed without problem at Geneva airport. There were no injuries.

Cause

The serious incident is due to the emission of smoke following a short-circuit caused by an assembly defect on a printed circuit of an audio box (seat electronic box SEB) located under a passenger seat on an airliner.

Safety recommendations

The report highlights a safety deficit which gave rise to a safety recommendation.

In accordance with Annex 13 of the ICAO, all safety recommendations listed in this report are addressed to the supervisory authority of the competent State, which must decide on the extent to which these recommendations are to be implemented. However, every agency, undertaking and individual is invited to attempt to improve aviation safety in the sense of the issued safety recommendations.

In the Ordinance on the Investigation of Air Accidents and Serious Incidents, Swiss legislation provides for the following regulation:

"Art. 32 Safety recommendations

[1] DETEC shall address implementation assignments or recommendations to FOCA, based on the safety recommendations in the reports from SAIB or on the foreign reports.

[2] FOCA shall inform DETEC regularly about the implementation of the assignments or recommendations.

[3] DETEC shall inform the SAIB at least twice a year about the progress made by FOCA with implementation."

1. Factual information

1.1 History of the flight

1.1.1 General

The description of the flight preparations and history of the flight is based on the recordings of the radio communications, crew conversations in the cockpit, radar plots and the statements of the crew members.

During the flight, the commander was at the controls of the aircraft (pilot flying – PF), with the co-pilot performing the function of assistant pilot (pilot not flying – PNF).

The flight took place under instrument flight rules, as a commercial operation.

1.1.2 Flight preparations

The crew of the Boeing 737-800 aircraft, registration D-AHLR, operating under callsign HLX43V, came on duty on the day of the incident at 09:25 UTC at Frankfurt airport in Germany. Their schedule envisaged a flight to Mahon in Spain followed by a return to Frankfurt.

The flight preparations took place in accordance with the requirements and the various documents making up the flight dossier were made available to the AAIB after the landing in Geneva.

In the 24 hours preceding the accident, aircraft D-AHLR made 8 flights. No significant defect is mentioned in the technical acceptance log.

1.1.3 The incident flight

On 7 June 2009, at 13:38 UTC, flight HLX43V took off from Mahon airport in Spain, destination Frankfurt, Germany with 197 passengers on board including 9 infants plus 6 crew members.

Shortly after the end of the cabin service, a passenger occupying seat E in row 5 reported to the senior flight attendant: "*Hier brennt's, Hier brennt's* (Something's on fire here! Something's on fire here!)". The latter confirmed the emission of acrid white smoke though no flame was visible; she thought it was coming from the floor of the cabin. She also noted a smell of burning. She immediately forwarded the information to the cockpit in a priority call and armed herself with a fire extinguisher, half of which she emptied over the location from which the smoke was issuing. The senior flight attendant inspected the floor and did not note any source of heat. Moments later, she associated the smell with burnt wiring and informed the commander, who asked her to join him in the cockpit. The senior flight attendant described the situation and the measures already taken. She added that there was no panic.

In the meantime, the crew took the decision not to continue the flight to Frankfurt.

At 14:31 UTC, 20 NM south south-west of waypoint AOSTA at flight level FL 380, and heading for waypoint DITON, the crew of flight HLX43V made a MAYDAY distress call on the 128.155 MHz Swiss Radar frequency to report a fire of electrical origin on board their aircraft. They immediately requested clearance to descend and divert to Geneva airport. The ATC controller cleared them for a descent in successive stages and directed them initially to Geneva and then onto the St-Prex SPR VOR. Flight HLX43V was then cleared to descend to flight level FL 190. The ATC controller, after receiving the readback from the pilot, then turned to another aircraft in his sector, i.e. flight HLX5LW, and assigned it the 133.405 MHz frequency. The pilot of flight HLX43V, thinking that the information was intended for him, incorrectly read back the 123.405 MHz frequency and left the sector. The ATC controller did not immediately realise this and only realised that the aircraft was not responding when he instructed it to contact the 125.55 MHz frequency. It was then

14:33 UTC. The crew of an Alitalia flight reported on the frequency that flight HLX43V had switched to the 133.405 MHz frequency. The controller tried nonetheless to call back the aircraft in distress on his frequency. The crew of a Transavia flight in turn tried to make contact with flight HLX43V. Meanwhile the crew of HLX43V reported on the 133.405 MHz Zurich frequency, to the surprise of the controller who referred them back to the previous frequency. The crew reported that they had an emergency and were assigned the 124.225 MHz frequency. Simultaneously, the ATC units called flight HLX43V on the 121.500 MHz frequency and managed to make contact before sending it to the 125.550 MHz frequency.

It was 14:35 UTC when the crew of flight HLX43V contacted the 125.550 MHz frequency. The aircraft was passing flight level FL 250 descending to flight level FL 190. It was cleared to continue its descent, assisted by radar vectors. The ATC controller specified the runway in use before sending it to the Approach frequency 120.300 MHz.

On this frequency, the ATC controller offered it radar vectors which would shorten the distance between the aircraft and runway 23 and which would position flight HLX43V 5 NM on final approach. The crew rejected this option, explaining that the fire was now under control, that they still needed to make course corrections to avoid bad weather and that they needed time to prepare. The ATC controller asked the pilot to specify the number of persons on board and the possible presence of dangerous goods. He also asked about the location of the fire.

When the senior flight attendant had returned to her seat and fastened her seat belt for landing, the passenger in seat 5E again reported smoke. The senior flight attendant took the fire extinguisher and emptied it in the indicated location. She informed the commander, who now considered a possible emergency evacuation. The senior flight attendant communicated this information to her colleagues.

The aircraft was some fifteen NM on final approach when the crew confirmed to ATC that the fire was under control but that a glow was still visible at the location of the incident. They asked the air traffic controller to have fire-fighters standing by. The ATC controller said that the fire service had already been alerted and that they would enter the aircraft as soon as it had cleared the runway. He asked the pilots which access door the fire-fighters should use. From the information provided by the pilots, the intervention would be via the main front door, since the fire had occurred in the first section of the cabin.

It should be noted here that the cockpit crew considered an evacuation of the aircraft if the incident became more serious. This information was communicated only to the cabin personnel. From the ATC perspective, no such question was asked.

The crew of flight HLX43V was then sent to the Tower frequency, 118.700 MHz. At 14:55 UTC, the aircraft landed safely on runway 23 at Geneva Cointrin airport and used taxiway C to head for the Tarmac 68 position, following a runway vehicle.

Once the aircraft had come to a standstill, fire-fighters, equipped with thermal imaging cameras, made an external inspection of the aircraft. The commander advised ATC that there were no longer any smoke emissions and that the passengers would leave the aircraft by the ramps. The commander then addressed the passengers. Meanwhile, a ramp agent, accompanied by a fire-fighter, entered the aircraft and authorised the passengers to leave.

Other fire-fighters then entered the aircraft and carried out an internal inspection. A technician from a local company removed the electronic box of the audio system located under seat E of the fifth row. He showed it to the commander, who identified the smell of burning he had noticed earlier.

No one was injured and material damage was limited to the audio box.

The operator dispatched another aircraft to Geneva which enabled the passengers to return to Frankfurt the same evening.

The crew as a whole, under the influence of their commander, refused to give any information regarding this incident, demanding the presence of a representative of their company. The captain returned to his hotel, conducted a debriefing and returned to Germany the next day.

His hearing will be held at a later date in the premises of the German aircraft accident investigation bureau.

1.1.4 Incident location

Incident location	20 NM south south-west of waypoint Aosta, 65 NM south-east of Geneva airport (LSGG) over Italian territory
Date and time	7 June 2009, 14:31 UTC
Natural lighting conditions	Daylight
Altitude	FL 380

1.2 Injuries to persons

1.2.1 Injuries to persons

Injuries	Crew	Passengers	Total number of persons on board	Others
Fatal	---	---	---	---
Serious	---	---	---	---
Minor	---	---	---	---
None	6	197	203	Not applicable
Total	6	197	203	

1.2.2 Nationality of the crew

The crew consisted of six German citizens.

1.3 Damage to aircraft

The aircraft did not suffer any damage. Only the seat electronic box (SEB) of the audio system intended for passengers in seats D, E and F of the 5th row was out of service.

1.4 Other damage

Not applicable.

1.5 Personnel information

1.5.1 Crew

1.5.1.1 Pilot/commander

Person	German citizen, born 1963
Licence	Air transport pilot licence ATPL(A) according to Joint Aviation Requirement (JAR), first issued by *Bundesrepublik Deutschland Luftfahrt-Bundesamt Deutschland* on 10 January 1997.
Ratings class/type	Type Boeing 737 300-800 commander (PIC), valid till 26 October 2009. Rating for category III approaches, extended on 11 November 2008 and valid till 4 December 2009.
Ratings	Radiotelephony in English
Last proficiency check	Line check 2 June 2009
	Simulator Checks LPC/OPC on 22 April 2009
Medical certificate	Class 1, without restriction
	Valid till 4 December 2009
Last medical examination	5 November 2008
Commencement of pilot training	November 1996

1.5.1.1.1 Flying experience, approaches and landings

Total hours	8400:00 hours approx.
of which on the type in question	7280:00 hours approx.
During the last 90 days	223:00 hours approx.
of which on the type in question	223:00 hours approx.
During the last 24 hours	3:55 hours
of which on the type in question	3:55 hours
As commander	3:55 hours
Total number of approaches	Not counted
of which on the type in question	Not counted
Number of approaches during the last 90 days	71
of which on the type in question	71
Total number of landings	Not counted
of which on the type in question	Not counted
Number of landings during the last 90 days	33
of which on the type in question	33

1.5.1.1.2 Duty and rest times

Start of duty in the 48 hours preceding the serious incident	On 5 June no flight duty On 6 June 2009 at 00:00 UTC On 7 June at 09:25 UTC
End of duty in the 48 hours preceding the serious incident	On 5 June no flight duty On 6 June 2009 at 10:55 UTC
Flight duty time in the 48 hours preceding the serious incident	10:55 hours
Rest period in the 48 hours preceding the serious incident	19:07 hours
Flight duty time at the time of the serious incident	05:32 hours

1.5.1.2 Copilot

Person	German citizen, born 1978
Licence	Air transport pilot licence ATPL(A) according to Joint Aviation Requirement (JAR), first issued by the *Bundesrepublik Deutschland Luftfahrt-Bundesamt* on 17 January 2001.
Ratings class/type	Type Boeing 737 300-900 copilot (COP), valid till 14 May 2010. Rating for category III approaches, extended on 5 August 2008 and valid till 4 September 2009. Class SEP (single engine piston), valid till 19 May 2010.
Ratings	Radiotelephony in English
Last proficiency check	Not communicated
Medical certificate	Class 1 without restriction Valid till 21 June 2010
Last medical examination	15 May 2009
Commencement of pilot training	Not communicated

1.5.1.2.1 Flying experience, approaches and landings

Total hours	5157:00 hours
of which on the type in question	2657:00 hours
during the last 90 days	108:00 hours
of which on the type in question	108:00 hours
During the last 24 hours	2:02 hours
of which on the type in question	2:02 hours
As copilot	4776:00 hours
Total number of approaches	3877
of which on the type in question	783
Number of approaches during the last 90 days	35
of which on the type in question	35
Total number of landings	3871
of which on the type in question	778
Number of landings during the last 90 days	35
of which on the type in question	35

1.5.1.2.2 Duty and rest times

Start of duty in the 48 hours preceding the serious incident	On 4 June stby from 23:25 UTC On 6 June 2009 at 01:00 UTC On 7 June 2009 at 09:25 UTC
End of duty in the 48 hours preceding the serious incident	On 5 June stby till 11:25 UTC On 6 June 2009 at 12:24 UTC
Flight duty time in the 48 hours preceding the serious incident	11:24 hours
Rest period in the 48 hours preceding the serious incident	21:06 hours
Flight duty time at the time of the serious incident	05:00 hours

1.5.2 Air traffic control services personnel

Controller 1	Swiss citizen, born 1987 Workstation: UAC West, RE KL4
Controller 2	Swiss citizen, born 1978 Workstation: UAC East, Coach RE M4
Controller 3	German citizen, born 1967 Workstation: TCG RP INI North

Controller 4	Swiss citizen, born 1965 Workstation: TCG FIN
Controller 5	Swiss citizen, born 1975 Workstation: TWR ADC

1.6 Aircraft information

1.6.1 General information

Registration	D-AHLR
Aircraft type	Boeing 737-800
Characteristics	Medium-haul twin-jet
Manufacturer	Boeing Commercial Airplane Group, Seattle/Washington, USA
Year of construction	2002
Serial number	32907
Owner	NBB-Germany Lease Partnership one, Tokyo 103, Japan
Operator	Hapag-Lloyd Fluggesellschaft mbH, 30855 Langenhagen, Germany
Propulsion system	Manufacturer: CFM International Type: CFM56-7B26 (with winglet)
Equipment	3 X AlliedSignal, RTA-44D 2 X AlliedSignal, RVA-36B 2 X AlliedSignal, TRA-67A 2 X AlliedSignal, DMA-37B 1 X AlliedSignal, DFA-75B 2 X AlliedSignal, ALA-52B 1 X AlliedSignal, RTA-4B 1 X AlliedSignal, CAS-81 2 X AlliedSignal, RMA 55B 1 X AlliedSignal, ELT B406-4
Airframe operating hours	26065 hours
Number of airframe cycles	10152
Maximum permitted mass	76000 kg on take-off 65317 kg on landing
Mass and centre of gravity	Mass of the aircraft on take-off: 66562 kg Mass and centre of gravity were within the limits prescribed in the manufacturer's operating manual.
Permitted fuel type	Jet A1 kerosene
Type of fuel used on the incident flight	Jet A1 kerosene

Fuel reserves	According to the flight plan, the quantity of fuel on take-off was 8300 kg, including trip fuel of 4800 kg.
Registration certificate	Issued by the *Bundesrepublik Deutschland, Luftfahrt-Bundesamt***,** on 14 March 2003.
Airworthiness certificate	Issued by the *Bundesrepublik Deutschland, Luftfahrt-Bundesamt*, on 29 April 2002.
Airworthiness inspection certificate	Date of issue: 27 April 2009 Expiry date: 29 April 2010
Area of use	Commercial operation
Category	Passenger transport 1

1.6.2 Passenger entertainment system

The aircraft is equipped with an audio entertainment system for passengers.

Each cabin seat is equipped with a Digital Passenger Control Unit (DPCU) control. This unit enables a passenger to switch audio channels and adjust the volume. This control is linked to the Seat Electronic Box (SEB) of each row of seats. One SEB unit equips one row of three seats on each side of the central corridor.

The cabin of the Boeing 737-800 is equipped with 62 SEB electronic boxes for its audio distribution system. The SEB box is the key element of the audio distribution system. The SEB decodes the digitised audio data of the Audio Multiplex (AMUX) system located in the front of the aircraft and distributes the analogue audio to the three passengers in the row.

The electronic box of the defective audio system was manufactured by Rockwell Collins Inc. It bears part number 700-2218-001, serial number 34424 and manufacturing date 02/01. It was installed on the left, under seat E of row 5 (see fig. 1 and 2). The SEB supplied the audio output to the seats of passengers D, E and F of row 5. The examination of the SEB electronic box is covered in section 1.16.

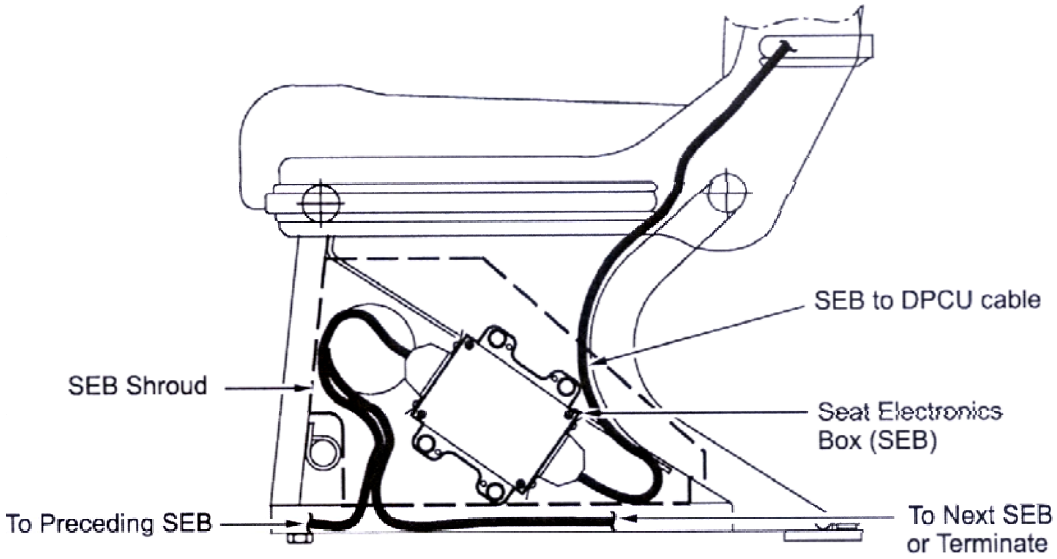

Fig. 1: Position of the Seat Electronic Box (SEB) under the seat

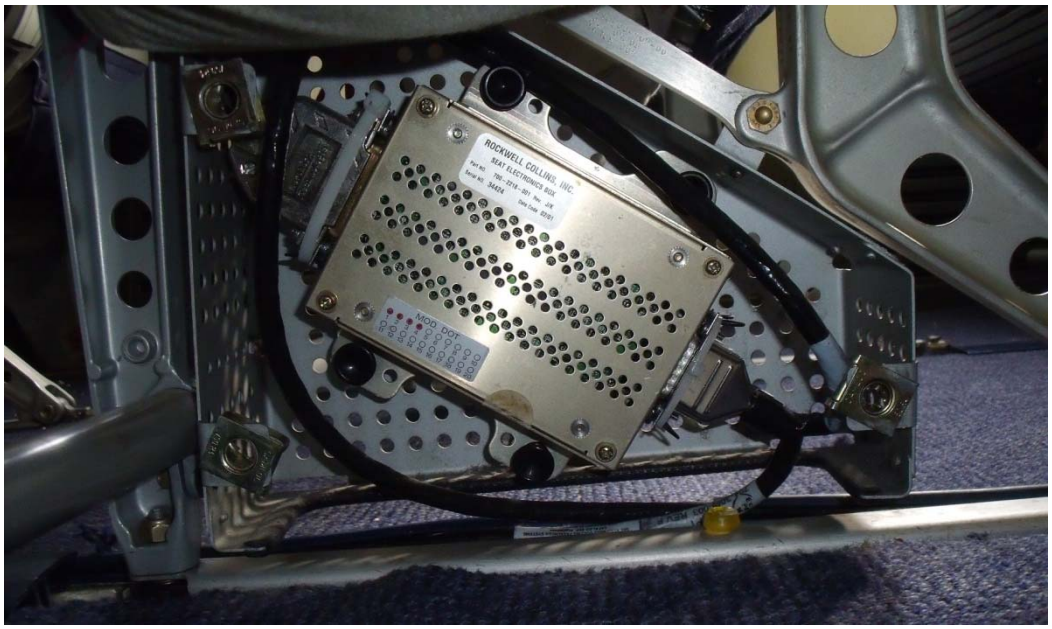

Fig. 2: Position of the Seat Electronic Box (SEB) under seat 5E

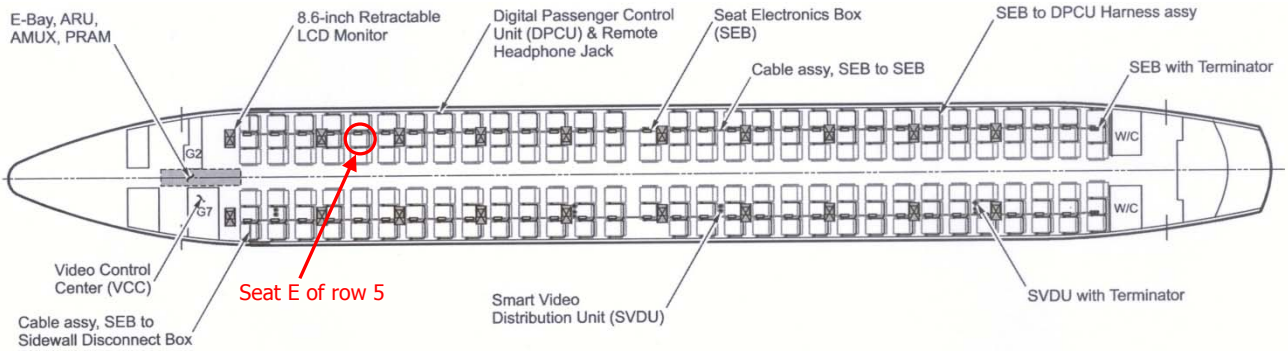

Fig. 3: Positioning of seat E in the 5th row in the cabin of the Boeing 737-800 and of the audio system distribution schematic

1.7 Meteorological information

1.7.1 General

The information contained in section 1.7 was supplied by MétéoSuisse.

1.7.2 Meteorological Information available to the crew before the flight

The crew had available a meteorological dossier for the flight concerned.

1.7.3 General meteorological situation

Ein umfangreiches Tiefdruckgebiet, das vom Ärmelkanal bis zum Baltikum reichte, führte mit südwestlicher Strömung feuchtlabile Luft in den Schweizer Alpenraum.

(translation) An extensive depression extended from the Channel to the Baltic Sea and conveyed an unstable humid air mass towards the Swiss Alps.

1.7.4 Meteorological situation at the location and time of the serious incident

The following information on local weather conditions at the time of the incident is based on a spatial and temporal interpolation of the observations made by several weather stations.

Meteo/clouds	*Free of clouds* *Cloud ceiling at approx. FL 270*
Visibility	*Over 20 km*
Wind	*FL 380, west south-west at 45 kt*
Temperature/dew point	*FL 380, -52°C / -70°C*
Hazards	*No known hazard*

1.7.5 Astronomical information

Position of the sun	*azimuth: 254*	*Elevation: 46*
Natural lighting conditions	Daylight	

1.7.6 Aerodrome meteorological information (METAR)

LSGG 071350Z 19016KT 9999 VCSH FEW035 FEW040CB SCT100 19/08 Q1008 TEMPO 23018G28KT SHRA=

LSGG 071420Z 21016KT 190V250 9999 -SHRA FEW030 FEW040CB SCT070 BKN100 19/09 Q1008 TEMPO 23018G28KT 5000 SHRA=

LSGG 071450Z 19014KT 9999 -SHRA FEW030 FEW040CB SCT050 BKN070 14/12 Q1010 RESHRA TEMPO 16015KT 5000 TSRA=

According to Météosuisse:

In clear text this means:

On 7 June 2009, just before transmission of the aerodrome meteorological observation of 14:50 UTC, the following meteorological conditions were observed at Geneva airport:

Wind	*From 190° at 14 kt*
Meteorological visibility	*Over 10 km*
Precipitation	*Light rain showers*
Cloud	*1-2/8 at 3000 ft AAL*
	1-2/8 of CB 4000 ft AAL
	3-4/8 at 5000 ft AAL
	5-7/8 at 7000 ft AAL
Temperature	*14 °C*
Dewpoint:	*12 °C*

Atmospheric pressure	*1010 hPa, pressure reduced to sea level, calculated with the values of the ICAO standard atmosphere.*
Evolution	*During the two hours following the meteorological information it is to be expected that periodically the wind direction will change to 160˚ with a speed of 15 kt, the meteorological visibility will change to 5000 m and the presence of stormy rain is to be expected. The overall duration of this change will probably be one hour maximum.*

1.7.7 Forecasts

At the time of the incident, the following aerodrome forecasts (TAF) applied:

LSGG GENEVA 07.06.2009 11:25
TAF LONG 071125Z 0712/0818 23012KT 9999 FEW020 SCT060 BKN080 TX19/0715Z TN11/0806Z TX20/0815Z TEMPO 0712/0722 8000 SHRA PROB30 TEMPO 0713/0722 24015G25KT 5000 TSRA FEW010 SCT040CB BKN050 BECMG 0718/0720 25004KT=

According to Météosuisse:

In clear text this means:

On 7 June 2009 the following meteorological forecasts between 12:00 UTC and 18:00 UTC the following day were announced for Geneva airport:

Wind	*From 230° at 12 kt*
Meteorological visibility	*Over 10 km*
Precipitation	*N/A*
Cloud	*1-2/8 at 2000 ft AAL*
	3-4/8 at 6000 ft AAL
	5-7/8 at 8000 ft AAL
Temperature forecasts	*On 7 June 2009, the maximum temperature of 19˚ was expected at 15:00 UTC. On 8 June 2009, the minimum temperature of 11˚ was expected at 06:00 UTC whilst the maximum temperature of 20˚ was expected at 15:00 UTC.*
Conditional forecasts	*On 7 June 2009 between 12:00 UTC and 22:00 UTC it was expected that, periodically, visibility would change to 8000 m and the presence of rain showers was to be expected. With a 30% probability, and periodically between 13:00 UTC and 22:00 UTC, the wind could change to 240˚ with a speed of 15 kt gusting to 25 kt, visibility could change to 5000 m, stormy rain could occur and cloud cover could be 1-2/8 at 1000 ft, 3-4/8 cumulonimbus at 4000 and 5-7/8 at 5000 ft. Between 18:00 UTC and 20:00 UTC the wind would change to 250° at a speed of 4 kt.*

1.8 Aids to navigation

1.8.1 Information on aids to navigation and landing

Geneva airport is equipped with an ILS23-LLZ CAT III / ILS05-LLZ CAT I system.

1.8.2 Information on the equipment on board the aircraft

Equipment allowing CAT IIIA category approaches.

1.9 Communications

Radio communications between the pilot and the air traffic control service took place normally and without difficulty up to the time of the incident.

From the moment the crew of flight HLV43V reported the distress situation and until the aircraft came to a standstill, no fewer than 9 frequency selections took place.

1.10 Aerodrome information

1.10.1 General

Geneva airport is located at the western end of Switzerland.

The reference elevation and temperature of the airport are 1411 ft and 24.8° respectively.

1.10.2 Runway equipment

A single runway 23/05 3900 x 50 m, reference elevation 1411 ft AMSL, geographical position 46°14'17''N, 006°06'32''E.

ILS23-LLZ CAT III / ILS05-LLZ CAT I.

Runway 23 take off run available - TORA 3900 m / landing distance available - LDA 3900 m.

Runway 05 TORA 3900 m / LDA 3570 m

1.10.3 Rescue and fire-fighting services

Geneva airport is equipped with category 9 fire-fighting resources according to Annexe 14 of the ICAO. The airport's professional fire brigade is on duty 24 hours a day. In the event of an alert, the intervention forces are able to remain in permanent contact with the control tower and with the police thanks to the alert centre and appropriate telecommunications equipment.

A medical section is integrated into the fire and rescue services; it is equipped with vehicles and qualified personnel and is also on duty 24 hours a day. The medical section has an advanced medical facility. It is permanently connected to the Emergency Medical exchange 144.

The entirety of Geneva International Airport's emergency plan is integrated into the OSIRIS cantonal system which is an organisation for interventions in exceptional situations.

1.11 Flight recorders

1.11.1 Flight parameters recorder

1.11.1.1 General

Type	SSFDR
Manufacturer	Honeywell
Serial number	10195

1.11.1.2 Condition of the flight parameters recorder

The flight parameters recorder was in perfect operational condition and its contents were backed up and analysed.

1.11.1.3 Result of the analysis of the flight data recorder (FDR)

The analysis of the contents of the onboard flight data recorder showed that the parameters remained within the aircraft's permitted flight envelope.

1.11.2 Cockpit voice recorder (CVR)

1.11.2.1 General

Type	SSCVR
Manufacturer	Honeywell
Serial number	0751

1.11.2.2 Condition of the cockpit voice recorder

The recorder was in perfect condition; it was possible to use the recordings in their entirety.

1.11.2.3 Result of the analysis of the cockpit voice recorder

Its contents corroborate the facts as presented in this report.

1.12 Wreckage and impact information

Not applicable

1.13 Medical and pathological information

The emission of smoke caused by the malfunction of the audio entertainment system box and the emissions of the extinguishing product had no effect on passengers' health.

1.14 Fire

Fire did not break out. Only the emission of smoke was observed.

1.15 Survival aspects

1.15.1 General

The emission of smoke was from a single SEB box and did not spread. It was dealt with by cabin personnel, who used an extinguisher.

1.15.2 Description of the evacuation of the occupants

Passengers left the aircraft normally using the ramps.

1.16 Tests and research

1.16.1 Examination of the SEB audio electronic box

The inspection report on the SEB electronic box, produced by its manufacturer, states the following:

(…) *Close inspection of the external body of the* SEB *showed no signs of heat exiting the unit through ventilation holes. All connector pins were in good condition with no signs of overheating.*

Close inspection of the inside cover did not show any signs or trace of heat leaving the box through the connectors and/or the ventilation holes.

The SEB *unit was opened and all circuit boards were examined for damage. There was no evidence of liquid contamination present. There was no detectable burn odor. The Circuit Card Assemblies (CCA) were then removed and examined.*

Capacitor C12 and R7 showed signs of severe heat damage. Damage was also found at the filtering inductor FL2 and capacitor C7. All these components C7, C12 and FL2 are adjacent to R7. Failures of R7 and fuse F1 led to the discovery of a bad switching controller U2. Significant dust contaminants accumulated on pins 2 and 3 of the component U2. A low-impedance reading measured between pins 3 (Drain) and 2 (Source) of U2 in the board indicated an electrical short.

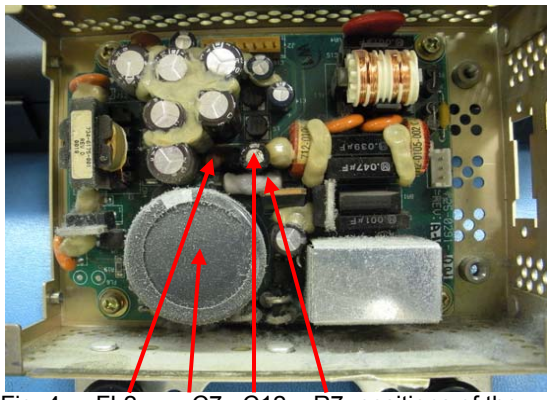

Fig. 4: FL2 C7 C12 R7, positions of the damaged elements

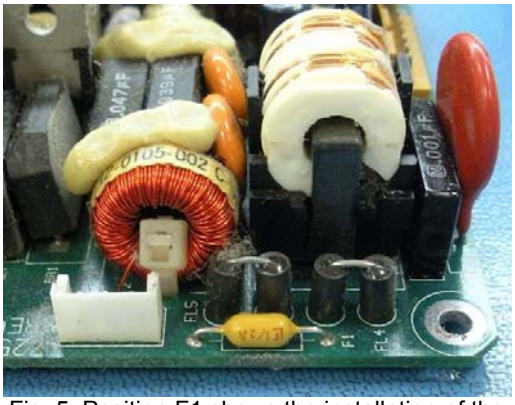

Fig. 5: Position F1 shows the installation of the fuse calibrated at ½ Amp.

Fuse F1 measured opened, but F2 checked OK with an Ohmmeter. There appeared to be an error in the installation of F1 and F2 fuses. A ½ Amp fuse was used at the location F1 when it was supposed to be a ¾ Amp device as called out in the BOM (Bill of Materials). Similarly, F2 was called out as a ½ Amp fuse in the BOM but the actual part was found to be a ¾ Amp fuse.

1.16.1.1 Cause of the failure of the SEB audio electronic box

Once the U2 shorted between pins 2 and 3, heavy current resulted in a flow through the main fuses F1 and F2. They were part of the circuit to protect against power supply failure. If F2 were a ½ Amp fuse, it could have an opened circuitry thus possibly saving U2 and its main regulator. However with a higher amperage fuse at F2, input voltage dropped further leaving the by-pass FET Q1 opened for R7 in the path of the high return current. Due to excessive current through R7, the resistor was overheated that in turn caused severe damages to its adjacent components C7, FL2 and C12. F1 eventually opened at the input connector J1 because it had a lower trip current, but U2 and the PCB (Printed Circuit Board) were already damaged.

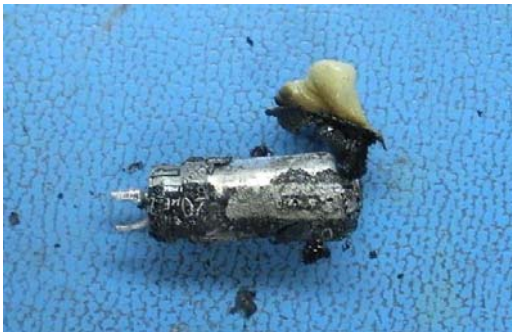

Fig. 6: Capacitor C12 overheated

Fig. 7: Capacitor R7 damaged

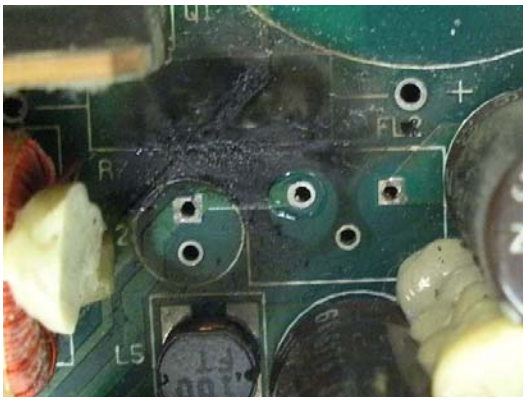

Fig. 8: Damaged printed circuit in the area in which capacitor R7 was fitted

Fig. 9: Damaged inductor FL2

The repair history showed that less one percent (1%) of failures resulted in replacing the F2 fuse when the reported failure was related to the power supply. Fuse F1 never needed a replacement if a power supply came in for a repair according to the record. As the repair record does not include any mention of other F1 failures and there is no record of incorrect fuse values, this is believed to be a very rare error. Since there was an error in installing the fuse F1 and F2 in this SEB *unit, it made sense that the power supply failure followed the weaker link of the two where F1 was located. The repair record also showed that with a disconnection of F2, U2 would be spared from being damaged.*

1.17 Organisational and management information

TUIfly is an alliance which unites 8 airlines in the TUI tourism group. Since 2008, all the group companies have been progressively adopting the TUIfly.com brand.

1.18 Additional information

According to the airline's technical manager, it is not possible to establish when the fuses were transposed, as the SEB is considered to be a Consumable Unit. Therefore, this equipment is not repaired. Certificates of conformity do exist, but only for the entirety of the audio system. Furthermore, he specifies that this malfunction is an isolated case. Following this incident, all the companies' SEBs have been checked. However, it is specified that other SEBs have been replaced for reasons of ageing but no modification has been made.

1.19 Useful or effective investigative techniques

Not applicable.

1.20 Information on air traffic control

The Geneva air traffic control service was in normal operation at the time of the incident.

The following sectors were involved in the incident:

- KL4 (Swiss Radar Area West), frequency 128.55 MHz, FL 355 and above. This is the sector in which the incident occurred.
- M4 (Swiss Radar Area East), frequency 133.405 MHz, FL 330 – FL 354.
- INI South/East (Swiss Radar Area West), combined sectors, frequencies 125.55 MHz and 124.225 MHz, lower limit of the airways up to flight level FL 244.

- APP (Geneva), frequency 120.300 MHz, lower limit of controlled airspace up to flight level FL 155.

- TWR (Geneva), frequency 118.700 MHz.

Transmissions were also made on the 121.500 MHz distress frequency by the sector KL4 operators with a view to recovering flight HLX43V, which had, in error, switched to a frequency which had not been assigned to it.

2 Analysis

2.1 Technical aspects

The emission of smoke in the row of seats D, E and F of the 5th row was quickly located under seat E by the cabin crew. As soon as smoke appeared, the senior flight attendant intervened immediately with appropriate resources. The commander was immediately informed of the situation.

The area of the defective element was kept under surveillance and the cockpit crew were regularly informed.

According to the technical manager of the TUIfly company, this incident is an isolated one and no similar case has been reported.

2.2 Human and operational factors

Having obtained the information received by the senior flight attendant, the commander did not hesitate to decide on a diversion. The choice of Geneva as a diversion airport was appropriate in that the distance in relation to the aircraft's position was compatible with the time necessary for the descent and preparation of the cabin. The meteorological conditions over the Geneva basin, although marginal, permitted the use of Geneva airport. The pilots had to and were able to integrate into their descent phase the management of the route to take according to the storm cloud formations. They even rejected a shorter approach, as proposed by ATC, since they wished, among other things, to enable the cabin crew to prepare for the landing.

The fact that the crew took for their own a frequency change that wasn't intended for them may be explained by an elevated level of stress.

The commander envisaged an evacuation if the situation worsened, and this possibility was communicated to all the cabin personnel.

The analysis of the Cockpit Voice Recorder reveals the exchange of information between the pilots and the good collaboration with the cabin personnel. It also highlights, through the dialogues, compliance with flight procedures.

The management of the incident was conducted without haste but with determination.

On the other hand, the fact that the crew as a whole, under the influence of their commander, refused to provide any information about this incident to the investigators present after the landing, demanding the presence of a representative of their company, denotes a lack of professionalism and a mistrust of Swiss legislation and of the ICAO standards and recommendations. Aviation professionals know that these investigations serve only to prevent accidents and collaborate if necessary.

2.3 ATC aspects

On the announcement of the "Mayday, Mayday, Mayday" distress call and of the intentions formulated by the crew of flight HLX43V, the KL4 sector ATC controller reacted quickly and directed the aircraft to Geneva airport, in accordance with the wish expressed by the pilots. He responded to the requests by the crew by informing them in particular of the Minimum Safe Altitude MSA and assigning them an immediate descent.

Later, when the crew of HLX43V erroneously changed frequency, the controller immediately made use of the 121,500 MHz frequency to restore contact, which had been temporarily lost.

During the approach phase, the APP controller asked the crew the usual questions:

- the number of persons on board
- the presence of hazardous products
- the location of the fire

and briefed the Airport Security Service SSA.

As described in section 1.1.3, as soon as the crew of flight HLX43V declared the distress situation and up to the time when the aircraft came to a standstill, no fewer than 9 frequency selections were made. It is obvious that the numerous frequency changes significantly increased the workload of the crew in a distress situation. Moreover, in this case, an erroneous change in frequency caused a temporary loss of contact between ATC and the crew.

In an emergency, only one frequency should be assigned to an aircraft and this should be retained until it lands.

3 Conclusions

3.1 Findings

3.1.1 Technical aspects

- The aircraft was authorised for IFR traffic.
- The mass and centre of gravity were within the limits prescribed by the aircraft manufacturer.
- The Boeing 737-800 D-AHLR had 26065 hours of operation and 10152 airframe cycles at the time of the incident.
- The audio Seat Electronic Box (SEB) located under seat E of the 5th row was defective and emitted smoke.
- The malfunction of the SEB was due to the internal short-circuit of an electronic component as a result of a manufacturing defect.

3.1.2 Crew

- The documents supplied indicate that the pilots were in possession of adequate licences and a valid medical certificate.
- The regulatory crew rest periods were complied with.
- The serious incident was handled in accordance with the procedures put in place by the aircraft manufacturer.

3.1.3 Management of the flight

- The incident flight was a flight from Mahon, Spain to Frankfurt, Germany.
- The incident occurred when cruising at flight level FL 380 at approx. 65 NM south-east of Geneva.
- The cockpit crew communicated a distress situation on a frequency operated by Swiss Radar and immediately requested a diversion to Geneva airport.
- The emission of smoke was brought under control.
- The passengers disembarked normally.
- No passenger or crew member was injured.
- The aircraft suffered no other damage.

3.1.4 Overall conditions

- The meteorological conditions during the final phase, although marginal, had no consequence on the safety of the flight which was being diverted.

3.2 Cause

The serious incident is due to the emission of smoke as a result of a short-circuit caused by an assembly defect on a printed circuit of an audio box (SEB) located under a passenger seat on an airliner.

4 Safety recommendations and measures taken after the incident

In accordance with Annex 13 of the ICAO, all safety recommendations listed in this report are addressed to the supervisory authority of the competent State, which must decide on the extent to which these recommendations are to be implemented. However, every agency, undertaking and individual is invited to attempt to improve aviation safety in the sense of the issued safety recommendations.

In the Ordinance on the Investigation of Air Accidents and Serious Incidents, Swiss legislation provides for the following regulation:

"Art. 32 Safety recommendations

[1] DETEC shall address implementation assignments or recommendations to FOCA, based on the safety recommendations in the reports from SAIB or on the foreign reports.

[2] FOCA shall inform DETEC regularly about the implementation of the assignments or recommendations.

[3] DETEC shall inform the SAIB at least twice a year about the progress made by FOCA with implementation."

4.1 Safety recommendations

4.1.1 Safety deficit

On 7 June 2009, the crew of the Boeing 737-800 aircraft, registration D-AHLR, making a charter flight from Mahon (LEMH) destination Frankfurt (EDDF) made a MAYDAY distress call on the Swiss Radar 128.155 MHz frequency, reporting a fire of electrical origin on board and their intention to divert to Geneva.

From the moment the crew of flight HLX43V reported the distress situation and until the aircraft came to a standstill, no fewer than 9 frequency selections took place. In the course of these multiple manipulations, the crew made an erroneous frequency change and this resulted in temporary confusion.

The aircraft, with 197 passengers including 9 infants plus 6 crew members on board, landed without problem at Geneva airport. There were no injuries.

4.1.2 Safety recommendation no. 441

When an aircraft declares itself in a distress situation on the air traffic control frequency, the Federal Office of Civil Aviation (FOCA) should require that a single frequency be assigned to it until it has landed.

4.2 Measures taken since the incident to improve aviation safety

All the SEB audio boxes of the company's fleet have been checked. No other defect has been found.

Payerne, 7 February 2012 Swiss Accident Investigation Board

This final report was approved by the management of the Swiss Accident Investigation Board SAIB (Art. 3 para. 4g of the Ordinance on the Organisation of the Swiss Accident Investigation Board of 23 March 2011).

Berne, 27 March 2012