Electrical fire, Incident involving aircraft OY-KIK, 22 March 1998, Kiruna airport, BD county, Sweden

Micro-summary: **While in cruise, the crew of this MD-81 suspected an electrical fire.**

Event Date: **1998-03-22 at 1123 UTC**

Investigative Body: **Swedish Accident Investigation Board (AIB), Sweden**

Investigative Body's Web Site: **http://www.havkom.se/**

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Report C 1999:8e

Incident involving aircraft OY-KIK,
22 March 1998,
Kiruna airport, BD county, Sweden

L-14/98

This is an English translation of the Swedish final report. If there are any discrepancies caused by the translation, the Swedish version is valid
Translation made by Dennis Anderson

1999-03-02 L-14/98

Swedish Civil Aviation
Administration

601 79 NORRKÖPING

Report C 1999:8e

The Swedish Board of Accident Investigation has investigated a serious incident which occurred on March 22nd 1998 at Kiruna airport , BD county, Sweden, involving an aircraft with registry OY-KIK.

In accordance with section 14 of the Ordinance on the Investigation of Accidents (1990:717) the Board submits herewith a final report of the investigation.

Olle Lundström Monica J. Wismar

Henrik Elinder Jan Mansfeld

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Report finalized 1999-03-02

Aircraft: registration and type	**OY-KIK,** Douglas DC-9-81
Owner/Operator	Finova Capital Ltd./SAS
Time of incident	22-03-1998 at 12:23 p.m. in daylight (alarm to the Kiruna tower) *Note:* All times in the report are given in Swedish normal time (SNT) = UTC + 1 hour.
Place	In the airspace approximately 130 NM [1] south of Kiruna, BD County, Sweden.
Type of flight	Scheduled traffic
Weather	Kiruna airport at time 12.20 p.m.: Wind 220°/ 9 knots, visibility >10 kilometers, no clouds below 5 000 feet, temp/dewpoint +5/-1 °C, QNH 1026 hPa, braking action good.
Numbers on board: crew	2/3
passengers	98 including 3 children between the ages of 2 and 12 years.
Personal injury	Two passengers were slightly injured during the evacuation.
Damage to aircraft	Limited
Other damage	None
Captain´s age and license	37 years, Airline Transport Pilot's License, (Swedish)
Captain´s total flying hours	8,670 hours, of which 4,855 on the type
Captain´s flying hours previous 90 days	161 hours, all of which on the type
First officer´s age and license	34 years, Commercial Pilot's License with Instrument rating (Swedish).
First officer´s total flying hours	5,250 hours, of which 3,502 on the type
First officer´s flying hours previous 90 days	163 hours, all of which on the type.

The Board of Accident Investigation (SHK) was notified on March 22nd 1998 that a serious incident with an aircraft registered OY-KIK had occurred during a flight to Kiruna airport, BD county, on the same day.

The incident has been investigated by SHK represented by Olle Lundström, chairman, Monica J. Wismar, chief investigator flight operations, Henrik Elinder, chief technical investigator (aviation), and Jan Mansfeld, chief investigator rescue services.

The investigation was followed by the Swedish Civil Aviation Administration represented by Klas-Göran Bask.

SHK investigates accidents and incidents with regard to safety. The sole objective of the investigations is the prevention of similar occurrences in the future. It is not the purpose of this activity to apportion blame or liability.

SUMMARY

[1] NM = Nautical Mile (1,852 meters)

The aircraft was on SAS's regular commercial route SK1046 between Stockholm/ Arlanda airport and Kiruna airport. When the aircraft was approximately 130 NM from Kiruna airport the cabin crew reported to the pilots that there was a burnt smell coming from the forward galley [2] . The smell was confirmed by the captain who associated it with that of burned bakelite or an electrical fire. He also noted that a wall in the galley area was obviously hot and that hot air was escaping from an air vent in the wall.

When the pilots, despite various measures, were unable to cope with the problem, the captain decided that they should continue to Kiruna airport and land on runway 03. The captain took out the emergency check list but decided that he did not have sufficient time to use it as they were so close to the airport. The aircraft was being flow by the first officer and the captain determined that the situation did not require his assuming of control from the first officer. It can be questioned if the captain shouldn't have taken over control of the flight and performed the landing himself, as is recommended in the SAS "Flight Operation Manual".

The landing took place with only emergency electrical power engaged, which means that the automatic brake system (ABS) and the system which prevents wheel locking (Anti Skid System) were disengaged.

When the first officer braked carefully after touchdown and during engine reverse thrust the four main wheels locked which punctured three of them. After the aircraft stopped it was enveloped in smoke, which was reported to the pilots by the ATC controller in the tower. The captain then ordered the crew to perform an emergency evacuation of the aircraft on the runway. During the evacuation one of the emergency evacuation slides did not deploy automatically but had to be deployed manually.

The technical investigation of the aircraft after the incident showed that the burnt smell was caused by a contained fire in or an overheating of an IC-circuit[3] and it's retainer in the water boiler control unit. The fire/overheat was likely caused by the installation of an incorrect type of circuit breaker and an incorrect LED-bulb[4] in the same electrical circuit. The faulty functioning of the emergency evacuation slide was possibly caused by the incorrect installation of a release cable.

It is the opinion of SHK, that the SAS emergency check list dealing with landing with the Anti Skid System inoperative is incomplete and that dealing with measures to be taken in the event of "SMOKE OR FUMES" is not user-oriented.

Recommendations

SHK recommends The Swedish Civil Aviation Administration to make sure that applicable emergency check lists for large aircraft

- give complete guidance concerning landing without the use of the Anti Skid System (C 1999:8 R1*)* and
- are user-oriented concerning measures to be taken in case of smoke, smell of a fire, or the like. (C 1999:8 R2)

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[2] Galley = The pantry in the cabin

[3] IC-circuit = (Integrated Circuit) Small electrical component

[4] LED-bulb = (Light Emitter Diode) Small bulb

1. FACTUAL INFORMATION

1.1 History of the flight

1.1.1 *The flight*

On the 22nd of March 1998 the aircraft was operating on SAS's scheduled route SK 1046 between Stockholm/Arlanda airport and Kiruna airport. The aircraft was piloted by the first officer. When the aircraft was approximately 130 NM from Kiruna the cabin crew had the impression of a burning smell from the forward galley. There was however no visual smoke. They informed the captain of this and he subsequently went into the cabin where he also could clearly sense the smell. He associated the smell with that of burnt bakelite or an electrical fire. The smell even spread itself into the cockpit.

The captain initially disconnected the electrical power to the galley (Galley power) but did not notice any change in the smell. Thereafter the walls in the galley area were felt of and it was determined that the right side of the forward cabin wall in front of seat 1C was obviously warm. There are two air vents on this wall facing the center aisle and the crew determined that hot air was emerging from the upper one of these. The captain presumed that these vents were part of the aircraft's air-conditioning system and therefore switched the air-conditioning control to MANUAL/ COLD. After a short pause it was determined that there was no change in either the smell or the hot air from the air vent.

After having considered suitable landing alternates and coming to the conclusion that the distance to them was generally the same as that to Kiruna, the captain decided, in consultation with the first officer, to continue to Kiruna airport. At this time they had the airport in sight and initiated a descent. When they had descended to approximately FL100 and had not noticed any change in the intensity of the smell or the hot air they switched over to Emergency Power, disengaged the aircraft's two engine-driven generators, and declared an emergency to Sundsvall Control. Thereafter they contacted the Kiruna tower and informed them of the situation and of their intentions to land straight-in on runway 03. This entailed landing in a tailwind. The captain took out the emergency check list but decided that he did not have sufficient time to utilize it because they were so close to the airport. In his opinion the situation did not warrant his taking over the controls from the first officer. The approach was flown manually with visual reference to the landing runway. A few times during the approach the pilots engaged the electrical power from the generators in order to, amongst other things, be able to trim the aircraft and to confirm that the landing gear was down and locked.

The landing, during which only emergency power was engaged, initially proceeded normally. The first officer was aware that ABS and Anti Skid System (ref. 1.6.3) were not operable and braked carefully during engine reverse after touchdown. Despite this all four main wheels locked, which resulted in the deflation of three tires. When the aircraft came to a stop it became enveloped in smoke, which was also reported to the pilots from the tower controller. At this point the captain ordered the crew to perform an emergency evacuation of the aircraft on the runway.

When the crew opened the exits for the emergency evacuation one of the emergency evacuation slides did not deploy automatically and had to be manually deployed. Notwithstanding this the crew's impression was that the evacuation took place quickly and without any significant problems.

Subsequent to the evacuation the captain, together with the airport fire commander who had now boarded the aircraft, made certain that everyone had exited the aircraft.

The crew and passengers were then gathered in the terminal building where the captain informed them of the occurrence.

1.1.2 *The rescue services*

The air traffic controller informed the airport fire commander of the emergency situation and that the “accident alarm” should be triggered prior to the landing. The airport fire commander notified the community rescue services in Kiruna and also informed the fire-fighting personnel at the airport.

When the alarm was sounded all of the airport rescue vehicles proceeded to runway 03. The airport fire commander requested that the air traffic controller inquire of the captain if it was possible to delay the landing until the community rescue services arrived. He was at this time informed that the landing was to take place as soon as possible.

After the landing the airport rescue force proceeded to the aircraft and prepared for an immediate rescue effort. The airport fire commander boarded the aircraft and was informed by the captain about what had taken place. Together they determined that there was no need of any fire extinguishing and that all persons had exited the aircraft.

When the community rescue services arrived the community rescue chief was informed of the occurrence and inspected the aircraft. The rescue chief decided after concurrence with the airport fire commander that the airport rescue services would guard the aircraft for approximately one hour and that the community rescue services should return to their station.

1.2 Injuries to persons

	Crew	*Passengers*	*Other*	***Total***
Fatal	-	-	-	-
Seriously injured	-	-	-	-
Slightly injured	-	2	-	2
No injuries	5	96	-	101
Total	**5**	**98**	**-**	**103**

1.3 Damage to aircraft

Limited

1.4 Other damage

None

1.5 Personnel information

The captain was 37 years old at the time and had a valid Airline Transport Pilot's License (Swedish).

Flying hours previous	*24 hrs*	*90 days*	*Total*
All types	6	161	approx. 8,670
This type	6	161	4,855

The first officer was 34 years old at the time and had a valid Commercial Pilot's License with Instrument rating (Swedish).

Flying hours previous	*24 hrs*	*90 days*	*Total*
All types	5	163	approx. 5,250
This type	5	163	3,502

1.6 Aircraft information

1.6.1 *General*

Owner/Operator:	Finova Capital Ltd./SAS	
Type:	DC-9-81	
Serial number:	48004	
Year of manufacture:	1980	
Gross weight:	Maximum allowable landing weight 58,967 kg., Actual landing weight 51,399 kg.	
Center of gravity:	Within allowable limits (17% LIZFW)	
Engine manufacture:	Pratt & Whitney	
Engine model:	JT8D-217C	
Number of engines:	2	
Fuel loaded before event:	Jet A1	
Aircraft flying time:	40,779 hours	
Aircraft cycles:	36,692	
Number of cycles since latest periodic check:	MSC/3D:	4 hours (5 flights)
	R-check:	35 hours (1998-03-15)
	B2-check:	35 hours (1998-03-15)
	P6-check:	792 hours (1997-10-05)
Engines operating time since overhaul:	Motor #1	Motor #2
	S/N P725834D	S/N P725991D
Total operating time:	13,860 hours	13,273 hours
Cycles:	11,949	13,022

The aircraft had a valid Certificate of Airworthiness.

1.6.2 *The water boiler*

In the forward galley of the aircraft there is a permanently installed electrical water boiler (Remote Water Boiler Tank) for the purpose of heating water to 90° C. The boiler is placed in a cabinet in front of seat 1C in the cabin. The cabinet is ventilated by two air vents directed towards the center isle. An electrical control element (RWB Electronic Box) is connected to the boiler to control the boiler's heating element. The

unit is enclosed in a metal box. Control and operation of the boiler is accomplished via a control panel (Electrical Module) near the galley ceiling.

1.6.3 *The brake system*

This aircraft type is equipped with an automatic braking system, Automatic Brake System (ABS). With the help of a lever on the instrument panel the system can be programmed prior to landing for three different braking effects; “MIN”, “MED”, and “MAX”. As an alternative to the use of ABS the pilots may always do the braking themselves by use of the footbrake on the rudder pedals.

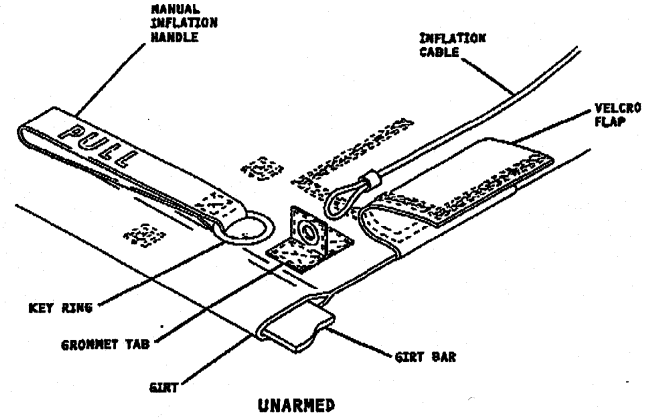
In addition, the brake system has a function that prevents wheel locking (Anti Skid System). This system is normally always activated but may be deactivated manually.

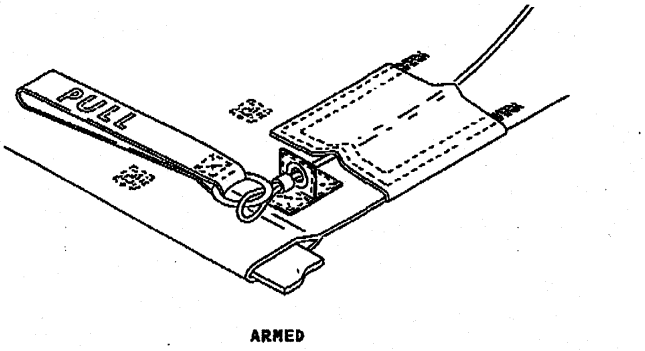
Both the ABS and the Anti Skid System are deactivated when emergency power is the only electrical power available to the aircraft. (ref. 1.16.3).

1.6.4 *The emergency evacuation slides*

For emergency evacuation purposes, four of the aircraft’s exits are equipped with a slide (Emergency Escape Slide) which is inflated by compressed gas. These are mounted on the aircraft doors and during flight a special slide bar (Girt Bar) on the slide shall be hooked securely to the floor in front of the respective door so that inflation occurs automatically when the door is opened. Inflation can also be accomplished manually by pulling on a cloth handle (Manual Inflation Handle).

Both the cloth handle and the slide bar are connected at one end to a wire (Inflation Cable) whose other end is inserted into the inflation valve of the compressed gas tube. The valve opens when the inflation cable is pulled out. To prevent accidental inflation of the slide during transportation to and from an aircraft the inflation cable shall be removed from the cloth handle and slide bar and “parked” under a cloth flap (Velcro Flap).





1.7 Meteorological information

Weather reports for the airports nearest the aircraft at the time of the occurrence.

- Skellefteå airport at 11:50 hrs: southerly winds at 6-10 knots, visibility >10 km., cloudcover 5-6/8 with cloudbase at 900 feet, temp./dewpoint +2/+0°C, QNH 1030hPa.
- Luleå/Kalax airport at 11:50 hrs: southerly winds at 7-9 knots, visibility >10 km., cloudcover 5-6/8 with cloudbase at 300 feet, temp./dewpoint +0/+0°C, QNH 1030 hPa.
- Kiruna airport at 12:20 hrs: wind 220°/9 knots, visibility >10 km., no clouds below 5000 feet, temp/dewpoint +5/-1°C, QNH 1026hPa.

1.8 Aids to navigation

Both the aircraft and the airport were equipped with customary navigational aids.

1.9 Communications

The captain called the ATC controller at the Kiruna tower at 12:16 p.m. to obtain weather information. Seven minutes later he reported that the crew suspected an electrical fire aboard and their intentions were to land immediately on runway 03. In addition to the normal radio communication prior to landing the tower controller inquired as to whether the crew could delay the landing until the community rescue services arrived which was answered in the negative by the captain.

1.10 Aerodrome information

Kiruna airport had operational status in accordance with the Swedish AIP (Aeronautical Information Publication).

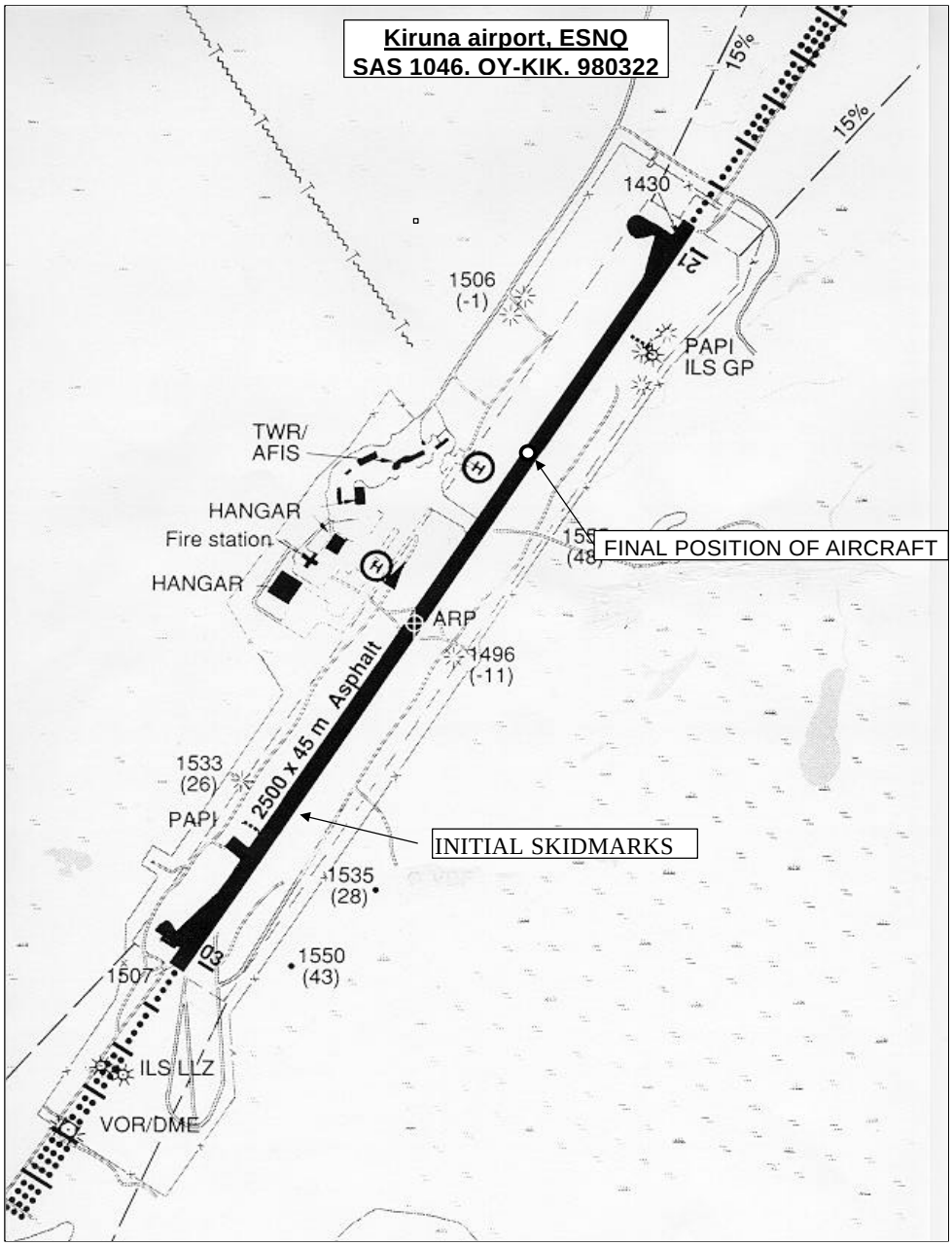
1.11 Flight and sound recorders

The aircraft was equipped with a flight recorder (Digital Flight Data Recorder- DFDR) and a voice recorder (Cockpit Voice Recorder- CVR). SHK has not found it necessary to perform any analysis of these.

1.12 Incident site and aircraft wreckage

1.12.1 *The incident site*

The smell of fire was discerned when the aircraft was in the airspace approximately 130 NM south of Kiruna. The incident lasted until such time as the emergency evacuation had been completed at Kiruna airport. The aircraft's touchdown took place about 300 meters down the runway and the skidmarks began on the runway centerline 537 meters from the runway threshold. The aircraft came to a stop 1744 meters from the threshold and slightly left of the runway centerline (ref. illustration).



1.12.2 *The aircraft*

All of the main gear tires were destroyed during the landing.

1.13 Medical information

Nothing indicates that the mental or physical condition of the crew had been impaired during the occurrence.

1.14 Fire

With the exception of a contained fire or overheating in a control box in the forward galley (ref. 1.16.1) there was no fire. After touchdown of the aircraft a heavy build-up of smoke ensued from the main wheel tires when the wheels locked.

1.15 Survival aspects

The deceleration of the aircraft was gentle and the aircraft emergency locator was not activated. There were a few persons among the passengers who were mildly shocked and these were afforded assistance. The aft emergency escape slide on the left-hand side failed to deploy automatically, which may have delayed the evacuation somewhat.

1.16 Test and research

1.16.1 *Troubleshooting of the galley electrical system*

With the assistance of the crew the smell of fire was localized to the area where the water boiler is placed. There were no observable signs that a fire had occurred in that area. During the technical investigation of the hot water system control box it was noted that a so-called IC-circuit had burned or overheated. The IC-circuit and it's retainer were partially charred.

The circuit breaker on the printed circuit card where the integrated circuit was installed was the incorrect type and had not tripped. The circuit breaker was of type "2 A fast" instead of "1 A slow", which is stipulated in the technical data. Further it was ascertained that the control panel LED-bulb for "READY-indication" was of the incorrect type. Instead of the stipulated 28V/10.0 mA the bulb was of type 28V/12.8 mA. With the exception of a small identifier text it is difficult to see any physical difference between correct and incorrect components. It has not been possible to establish when the incorrect components were installed in the control box and control panel.

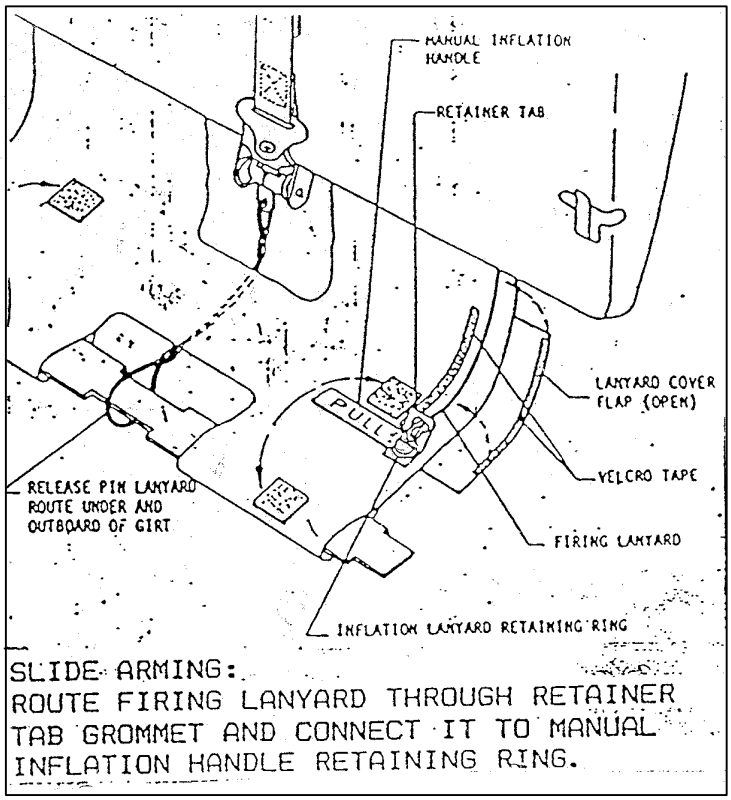
Further electrical defects or other sources of the burnt smell in the galley area were not possible to ascertain. After the incorrect components were exchanged the hot water system was then tested and was determined to function normally without remarks.

1.16.2 *Troubleshooting of the emergency evacuation slides*

The automatic firing mechanism on the evacuation slide that had to be deployed manually was investigated in accordance with applicable testing practices and there was no defect found. The only probable explanation as to why the slide failed to

deploy automatically when the door was opened was, according to the investigation, that the firing lanyard was not attached correctly to the slide bar (Girt Bar). This has not been possible to verify subsequent to the occurrence as the lanyard was "completely extracted" in connection with the manual deployment.

The instruction illustration shown below (full size), concerning the installation of the firing mechanism, is included in the shipping carton of the emergency evacuation slide.



1.16.3 *Generator disengagement*

During disengagement of the electrical supply from the engine generators the aircraft electrical system is supplied by a battery-driven emergency electrical system (Emergency Power). In order to conserve the aircraft batteries, only absolutely necessary electrical systems are connected to the emergency system. This is to enable the crew to perform a safe flight and landing. According to AOM[5] 1.6, several flight and navigation instruments on the first officer's instrument panel will be inoperable under these circumstances, which has been verified in a simulator.

1.17 Organisational and management information

The airline SAS pursues heavy national and international air traffic. The head office is located in Stockholm, where operational management is also stationed. There are a number of operations manuals, amongst them the following:

[5] AOM = Aircraft Operations Manual

Flight Operation Manual (FOM)
The FOM states the airline's general routines for all operational activities. In FOM section 3.2.1, paragraph 5 general guiding principles are stated as to when and to what extent the flight officer should fly the aircraft. Concerning who shall execute the landing in the event that the aircraft is impaired with a serious malfunction, the following is stated:
"Note
The CDR[6] shall pay due regard to consequences of a serious malfunction in flight before delegating an approach and/or landing to his first officer. It should be regarded as normal practice during such conditions that the CDR executes the approach and landing himself."

Aircraft Operations Manual MD-80 (AOM)
The AOM states specific instructions and operative limitations with regard to the aircraft type. In section 4.1 a description is provided of how the crew shall deal with different types of possible emergency situations (Emergency/Malfunction Check List). This check list is a version adapted by SAS from the aircraft manufacturer's emergency check list. The applicable sections are enclosed in appendix 2.

2 ANALYSIS

2.1 The flight

The burning smell in the forward galley was clearly evident to both the cabin crew and the captain. The apprehension of the crew was justified, especially when they determined that the wall adjacent to the area from which the smell came was obviously hot and that hot air was escaping from the vent. They were not aware of the fact that a hot water boiler was installed in that space and had never before had occasion to feel that wall area for heat. Fire or the risk thereof during flight is always a serious matter with respect to flight safety. The captain's decision to declare an emergency and prepare for an immediate landing was therefore correct.

The captain's measures to find the source of the burning smell and both pilot's preparations for landing took place without the use of the emergency check list, which was deviation from the company's regulations. Taking into consideration the fact that they were so close to the airport and that a complete reading of the extensive emergency check list (ref. 2.4) could have delayed the landing, SHK quite understands that it was not put to use. Generally the pilots shall not take any measures extraneous to the AOM, but the check list in question in this case did not provide any guidance that would have facilitated their management of the situation, and their management of the situation was in any case appropriate. The fact that the emergency check list was not used had therefore little effect on the sequence of events here, but in another emergency situation could have lead to an essential measure for the safety of flight being overlooked.

The captain chose to allow the first officer to carry out the approach and to land the aircraft. It is true that the landing took place with good visual references to the

[6] CDR = Commander

landing runway but the fact that only emergency power was available resulted in several of the first officer's flight and navigation instruments being inoperable. This could have caused problems if, for example they were forced to discontinue the approach for some reason. Furthermore a technical failure of the aircraft was suspected and they intended to land without the use of ABS and Anti Skid System, which constituted an abnormal situation. It can therefore be called into question whether the captain should have taken over the flight as they approached the airport and performed the landing himself in accordance with the recommendation in the FOM.

In spite of the fact that the first officer was aware that he would be forced to brake without the assistance of Anti Skid and therefore braked carefully after touchdown, the main wheels locked with the result that three of the four tires were deflated. Normally, braking always takes place with the Anti Skid System activated and this occurrence shows how difficult it is in practice to brake manually without locking the wheels when the system is disengaged.

The present instruction in the emergency check list, section 4.1/14 page 6 "ANTI-SKID LIGHT ON", only gives the following guidance:

- Landing distance…… Multiply by 1.5
- Apply brakes as in a normal manual brake landing
- Reverse thrust…… As required

Considering how difficult it is to brake the aircraft without access to the Anti Skid System, SHK considers the check list to be incomplete. In addition to the instructions quoted above it should also contain recommendations about the importance of the correct touchdown point, touchdown speed and engine reverse. Furthermore a warning should be given concerning the obvious risk of main wheel lock-up and the resulting tire deflation. There exists therefore a need to amplify this section of the check list and to suitably train pilots about the correct method of manual braking. This need most likely exists with several other operators of heavy aircraft.

As smoke enveloped the aircraft after it came to a stop on the runway and the source of the burnt smell was still unknown, the decision to order the emergency evacuation of the aircraft was correct.

2.2 The fault in the hot water system

No source of the smell other than the burned or overheated IC-circuit and it's retainer was found. Normally the circuit breaker to the printed circuit card should prevent anything such as this happening. For some unknown reason the indicated amperage of the circuit breaker was "2 A fast" instead of "1 A slow". This, in combination with the possible shorted LED-bulb of incorrect type, which was installed in the same circuit, was the probable explanation for the fire/overheating and therefore the smell. The damage was confined to the interior of a sheet metal box and it is therefore doubtful that a fire could have propagated even if the electrical supply to the galley had not been interrupted.

It has not been possible to determine either when or where the components in question were installed. It is however remarkable that two components of incorrect type were installed in the same electrical circuit during the same time. These circumstances suggest that carelessness or inadequate procedures have occurred within some level of manufacture or maintenance.

2.3 The malfunction in the emergency evacuation slide

The emergency evacuation in this case took place under favorable conditions and the malfunction of one of the emergency evacuation slides had, in and of itself, minimal influence on the chain of events. In a similar but more critical situation the absence of automatic deployment of a slide could have serious consequences. It was therefore a serious deficiency in the installation of the slide if the firing lanyard was not correctly connected. The instruction illustration as to how the cable should be connected after it has been secured for transportation is physically small and it is not sufficiently evident therein how the cable shall be connected to both the retainer tab and the manual inflation handle. It is the opinion of SHK that the illustration should be made clearer.

2.4 Emergency/Malfunction Check List

The instructions in the Emergency/Malfunction Check List concerning “SMOKE OR FUMES” (AOM 4.1/1) encompass 5 pages (excluding the references to other check lists) and contains nine alternative courses of action. Based on the situation that arose during the flight, there are at least three different conceivable alternatives, all with partially different measures to be taken;

- “Source of smoke not determined.”
- “Lavatory, galley or cabin smoke.”
- “Electrical smoke. >”Smoke or fumes continue.” >”Time does not permit complete procedure.”

Due to the additional fact that this section covers several pages, there is a great risk that the user, in a stressful situation, will “end-up wrong”, and that the pilots will not receive the support they need in a situation where fire or the risk of fire rises. An emergency check list should assist the pilots in the simplest and quickest way to take the necessary measures to guarantee the safety of the flight and carry out a safe landing. SHK considers that the present formulation of the check list in question does not satisfy these requirements. The fact that the captain did not think that he had the time to make use of the check list also indicates this. There is therefore reason to revise this section of the check list.

2.5 The rescue services

The rescue services performed correctly and in accordance with current regulations.

3 CONCLUSIONS

3.1 Findings

a) The pilots were qualified to perform the flight.
b) The aircraft was airworthy.

c) The burned odor was caused by a contained fire in or an overheating of an IC-circuit and it's retainer in the water boiler control unit.
d) The incorrect type of circuit breaker and an incorrect LED-bulb were installed in the same electrical circuit.
e) The emergency landing was justified.
f) The pilots did not use the emergency check list.
g) During braking, which took place with ABS and the Anti Skid System disengaged, three of four main wheel tires were deflated.
h) The automatic deployment of one of the emergency escape slides did not function.
i) The functional failure of the emergency escape slide was likely caused by an incorrectly installed firing lanyard.
j) The emergency check list concerning landing with the Anti Skid System inoperative is incomplete.
k) The emergency check list concerning "SMOKE OR FUMES" is not user-oriented.

3.2 Causes of the incident

The incident was caused by fire in or overheating of an IC-circuit and it's retainer in the control unit for the water boiler, likely as a consequence of an incorrect type of circuit breaker in combination with an incorrect LED-bulb.

4 RECOMMENDATIONS

SHK recommends The Swedish Civil Aviation Administration to make sure that applicable emergency check lists for large aircraft

- give complete guidance concerning landing without the use of the Anti Skid System (C 1999:8 R1) and
- are user-oriented concerning measures to be taken in the event of smoke, smell of a fire, or the like. (C 1999:8 R2)