



**Final Report
by the Aircraft Accident
Investigation Bureau**

concerning the incident

of the airplane Embraer EMB 145 LU, HB-JAT
on 20 August 2002
at Zurich Airport

Ursache

Der Vorfall wurde durch die überhitzte Taschenlampe rechts verursacht, die ungewollterweise eingeschaltet geblieben war als sie in der Halterung verstaut wurde.

Da die Taschenlampe durch das Stromsystem des Flugzeugs ständig wiederaufgeladen wird, entleert sich der Akku nicht und bleibt deshalb während Stunden funktionstüchtig.

Aircraft Accident Investigation Bureau

FINAL REPORT

This report has been prepared for the purpose of accident/incident prevention. The legal assessment of accident/incident causes and circumstances is no concern of the incident investigation (art. 24 of the air navigation law)

AIRCRAFT	Embraer EMB 145 LU	HB-JAT	
OPERATOR	Swiss International Air Lines		
OWNER	Swiss International Air Lines		
PILOTS	PIC: Swiss citizen, male, born 1972 COPI: Swiss citizen, male, born 1971		
LICENCES	ATPL CH/JAR (PIC) and CH/JAR (COPI)		
FLIGHT EXPERIENCE (PIC)	Total 2800	In the previous 90 days 94	
	On accident type 550	In the previous 90 days 94	
FLIGHT EXPERIENCE (COPI)	Total 2134	In the previous 90 days 82	
	On accident type 82	In the previous 90 days 82	
PLACE	Zurich Airport		
DATE AND TIME	20 August 2002, 20:27 UTC LDG Time		
TYPE OF FLIGHT	Commercial scheduled flight / Swiss 1027		
PHASE OF FLIGHT	Entering Rilax Holding		
TYPE OF INCIDENT	Smoke in cockpit		
INJURIES TO PERSONS			
	Crew	Passengers	Others
Fatal	---	---	---
Serious	---	---	---
Minor or none	4	21	
DAMAGE TO AIRCRAFT	---		
OTHER DAMAGE	---		

HISTORY OF FLIGHT

On the evening of August 20th 2002, the flight CRX 1027 was flown with a Embraer aircraft EMB 145 registered HB- JAT. The flight from DUS to ZRH was scheduled to depart Düsseldorf at 18:50 UTC. The aircraft left the stand at 19:17 and departed on runway 23 L at 19:27. The flight progressed normally until the crew was advised of a Holding delay over RILAX. An Estimated time for Approach of 20:41 was given to the crew of flight CRX 1027. When entering the Holding at RILAX the COPI realized "electric smell and smoke". The Commander (CDR) was pilot flying (PF) and also realised the electric smell. With the consent of the CDR the COPI declared an emergency and requested to proceed for an immediate approach. The crew donned the oxygen masks and followed vectors given by ATC for runway 16. During the descent the CDR several times reassessed the situation by relieving his oxygen mask. He considered that the smell did not increase. The cabin crew was asked if smoke or smell was felt in the cabin. This was not the case. The Flight attendant was informed about the situation and that a normal landing will be carried out and disembarkation at the normal stand is planned.

A safe landing on RWY 16 was carried out. The aircraft taxied to his stand and the passengers were disembarked normally.

INVESTIGATION

The airport authority of Zurich informed the Swiss Federal Aircraft Accident Bureau about the incident. An investigation according to ICAO Annex 13 was opened on the same day.

FINDINGS

General

- All crew members held valid licences.
- The aircraft had no story of smell or smoke.
- The use of the oxygen masks and the intercom with the masks was working properly.
- For the investigation, a detailed work plan has been established by Swiss in cooperation with SR- Technics and a thorough inspection of all wiring and the whole cockpit area was carried out. All electrical fans and equipment were checked.
- No trace of any burned equipment or wiring was found.
- An extensive run- up was performed without any signs of smell or smoke.
- During the extended time of aircraft connected to external power one engineer realized electrical smell in the area of the COPI. A thorough search revealed the RH torchlight to be switched on and the lens and torchlight- holder showing strong signs of overheating.
- The torchlight was removed and an investigation carried out.
- The CVR download did not reveal any abnormal operational conditions.

Torch Lamp

- The torch lamp EF-2C manufactured by DME Corporation was installed in the Embraer EMB 145 a standard equipment.
- The torch lamp set has a P/N P2-07-0009-120 and contains also a holder, in which the lamp can be stowed when not in use. The holder is equipped with a pair of contacts through which the torch lamps battery is recharged when the aircraft electrical shed bus 2 is switched "ON".
- The torch lamp is equipped with a rechargeable battery of 6 volts and a bulb which is feed when the on/off switch is switched "ON". A red LED indicates that the battery recharge circuit is supplied.
- When the lamp is placed in the holder without being switched "OFF" the lamp will continue to operate. There is no mechanical restraint to prevent the lamp to be stowed with the switch in the "ON" position.
- When the aircraft electrical shed bus 2 is supplied the torch lamp recharge circuit is supplied. The recharging also functions when the lamp is switched "ON".
- The removed lamp sowed heat signs on the lens and at the upper cover of the lamp holder.
- The DME corporation has issued a SERVICE INFORMATION LETTER Y2-01-0022 addressing the problem of melted components of it's EF-2C lamps. It was proposed to use a bulb of a lower intensity (P/N A1-14-0001-002), which would create less heat than the originally used bulb (P/N A1-14-0002-002).
- The removed lamp from HB- JAT was of the lower intensity. There is no P/N readable on the bulb, but through test a current of 540 mA was established compared with 530 mA of a originally A1-14-0001-002 bulb. The former used A1-14-0002-002 has a current of 1220 mA.

ANALYSIS

The "electric smell" was a result of melted parts of the torch lamp installed on the right side console beside the Copilot.

When the lamp was stored in the holder after use without being switched "OFF" it would remain lit and would heat up the lens. As the heat is restricted by the top cover of the holder it is unable to escape.

Normally the battery would be depleted after a certain time or at least be discharged to a lower voltage. Through the installed recharging circuit the time of full bright light is extended and the lens and cover heated up more and for longer time. Therefore the lens and cover were starting to melt and started developing on acrid odour which was interpreted by the crew as "electric smell".

The torch lamp was examined. It was confirmed that a temperature of 230°C is reached under these circumstances. At this temperature, a plastic smell was observed. Already at a temperature of 200°C the plastic of the lens and the holder start to melt and become viscous.

Smoke can only be observed, if the plastic would contact directly the bulb, which was not the case in this lamp.

The lamp was found in the "ON" position the day after the incident by a Swiss maintenance supervisor after the aircraft had been investigated by maintenance for a long time. Because the aircraft was supplied by ground power for an extended period in the hangar it was possible for the lamp to heat up again.

CAUSE

The incident was caused by an overheated RH torchlight, which has inadvertently remained switched on when placed in its recharging bracket.

Due to the fact, that the torchlight is constantly recharged by the aircraft electrical system, its battery does not deplete and therefore remains operational during hours.

ACTION BY THE OPERATOR

Immediately after the incident, all Torch lamps installed in Embraer 145 aircraft were inspected. Two more lamps have been found with deformed plastic lenses but not as strong as in the incident lamp.

The engineering of the operator proposed to drill a hole in the upper cover of the holder. Thereby the heat will not be trapped between the lens and the cover of the holder and also the crew will see the light shine through the top of the holder if the lamp has not been turned off.

This modification has been carried out on all Torch lamps installed in Embraer 145 cockpits of the operator through an internal service bulletin LX-ER4-33-1.

Embraer has issued on June 16; 2003 a Service Letter SNL 145-33-0011 with the goal to inform other operators.

Berne, 10 May 2004

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Fig. 1 Lens of Torch lamps with melted plastic



Fig. 2 Top Cover of Torch lamp holder