

Technical Analysis of the Accident: Swiss Flight LX1885 with an Airbus A220 – From Uncontained Engine Failure via Smoke on Board, A **Dead Flight Attendant** to Alleged Cover Up at Austrian's Federal Safety Investigation Authority (SUB)

Air conditioning systems of all large passenger aircraft (except the Boeing 787) take the air unfiltered from the compressor of the engine (bleed air)! Any contamination in normal operation and in failure cases (as in LX1885) goes straight into cockpit and cabin. Such a **system design is inadequate** as stated for decades in SAE AIR 1168-7A [1]: "... the risk of obtaining contaminated air from the engine may preclude its use for transport aircraft, regardless of other reasons [like financial advantages]."

Why is smoke on board after a severe engine failure? The air conditioning system takes air from the engine!

Why a dead flight attendant? Oil fumes are toxic, and aircraft do not offer adequate breathing protection!

Why is the Austrian Air Accident Investigator (SUB) providing an intermediate report below standards?

Why is the Austrian Air Accident Investigator (SUB) prosecuted? Why is the case transferred to the STSB in Switzerland?

Aircraft manufacturers / airlines do not have an interest that the answers given above get into an (intermediate) report!

PURPOSE

Poster and paper add missing technical detail to Swiss flight LX1885 with an Airbus A220-300 (formerly Bombardier C-Series CS-300) on 2024-12-23. The flight received much media attention, which initially centered around the emergency landing in Graz, Austria and later around the death of a flight attendant. The Graz public prosecutor's office is investigating "unknown perpetrators on suspicion of grossly negligent homicide and negligent bodily harm." Like in other cases, media reporting seldom goes into technical details (except [2][3]). But even the "Written Preliminary Report" [4] by Austrian's Federal Safety Investigation Authority (Sicherheitsuntersuchungsstelle des Bundes, SUB) lacks the most fundamental facts. Not even the airline is named. The report does not even ask the question, why and how the smoke came from the engine into the aircraft cabin, if passengers and crew were protected against smoke on board, if smoke hoods for the crew and various oxygen masks in the cabin can protect people in case of smoke on board. All these unposed and unanswered questions need to be addressed.

BACKGROUND

The aircraft registered HB-JCD was performing a flight from Bucharest Otopeni (Romania) to Zurich (Switzerland) with 74 passengers and 5 crew on board. It was enroute at FL400 about 20 nm eastnortheast of Graz (Austria) when the crew decided to divert to Graz reporting smoke on board. The aircraft landed about 19 minutes after the decision to divert. The aircraft was evacuated. About 17 passengers and 4 crew needed medical attention. 13 passengers received minor injuries. On Dec 26th, 2024, two of three cabin crew were still in hospital care. On Dec 30th, 2024, the seriously injured flight attendant died. Three other members of the crew received minor injuries. Original cause was an uncontained engine failure. The deceased crew member was wearing a Protective Breathing Equipment (PBE). [5]

METHODOLOGY

Technical knowledge about aircraft and systems in general and about the Airbus A220 in particular together with certification rules is applied to the case and its known details from the Preliminary Report, media reporting, and statements from Swiss.

FINDINGS

1.) Smoke got into the cabin and cockpit [6] because the air for cabin ventilation and air conditioning comes from the compressor of the engine as so-called bleed air [7].

2.) Pilots are protected with their oxygen masks in such a situation. Certification standards (EASA CS-25.1447) demand: "If certification for operation above 7620 m (25000 ft) is requested ... each flight crew member must be provided with a quick-donning type of oxygen dispensing unit, connected to an oxygen supply terminal, ... can be placed on the face ... with one hand within 5 seconds". Cabin crew and passengers are not protected in a likewise manner.

3.) Cabin crew members are offered only these units and devices, which are unfit for the situation:

- Fixed standard oxygen units (the same as for passengers) are installed in each cabin crew station, lavatory, and galley.
- Cabin attendant portable oxygen devices are located in several places in the cabin (galley area, attendant seat area, overhead stowage, cabin stowage/doghouse). The portable devices provide protection during emergencies. They consist of a high-pressure oxygen cylinder and an oxygen mask. Certification standards (EASA CS-25.1447) demand that portable oxygen devices must be "available for each cabin crew member". The small portable oxygen cylinder lasts for a maximum of three hours. This is not sufficient for a long-range flight. But why did crew use PBE instead of these portable oxygen devices on LX1885?

References

- [1] <https://doi.org/10.4271/AIR1168/7A>, [2] <https://perma.cc/S3DW-VREV> (ger)
- [3] <https://perma.cc/V5HM-WHVQ> (eng), [4] <https://perma.cc/Y7GR-E5PE>
- [5] <https://avherald.com/h?article=521ec68d>, [6] <https://perma.cc/2JGL-UV2B>
- [7] <https://doi.org/10.5281/zenodo.11524119> (Highlights of the Airbus A220)

FINDINGS (continued)

- Portable Breathing Equipment (PBE) i.e. smoke hoods protect cabin attendants' eyes and the respiratory system. Certification standards (EASA CS-25.1439) demand that "portable protective breathing equipment must be installed ... for fighting fires", "equipment must be installed for the maximum number of crew members expected to be in the area during any operation". "The equipment must be designed to protect the appropriate crewmember from smoke, carbon dioxide, and other harmful gases while on ... duty or while combating fires." "The equipment must include masks covering the eyes, nose and mouth." "The equipment must supply protective oxygen of 15 minutes duration". The system allows inhalation of regenerated air and returns the exhaled air to the regeneration system. Together with a chemical oxygen generator the system ensures the required minutes of breathing autonomy. All three measures (a, b, c) are far from ideal in case of a Cabin Air Contamination Event (CACE) for cabin crew members.

4.) Only limited oxygen supply of short duration is delivered to passengers. Most aircraft use a chemical generator for this purpose. If certification for operation above 9144 m (30000 ft) is requested, certification standards (EASA CS-25.1447) demand: "the dispensing units providing the required oxygen flow must be automatically presented to the occupants before the cabin pressure altitude exceeds 4572 m (15000 ft) and the crew must be provided with a manual means to make the dispensing units immediately available in the event of failure of the automatic system. The total number of dispensing units and outlets must exceed the number of seats by at least 10 %." The oxygen system is installed (not for a CACE, but) for coping with an emergency descent maneuver.

5.) Austrian's Federal Safety Investigation Authority (SUB) is under pressure. A criminal complaint filed by the List law firm states "suspicion of alleged corruption, obstruction of justice, and suppression of evidence" in case of LX1885 [8]. The beneficiary would be the German Lufthansa Group, which includes Swiss. In connection with another investigation, the Vienna Public Prosecutor's Office is investigating against SUB director Bettina Bogner on suspicion of abuse of office and favoritism [9]. The SUB was audited by the Austrian Court of Audit (Rechnungshof Österreich) in 2024. The Court found "numerous unresolved challenges" [10] and emphasized that "the independence of the SUB and the necessary independence of the security investigations must be ensured" [11]. For all this, the SUB hands over the case to the STSB in Switzerland [12], [13].

PRACTICAL IMPLICATIONS

Cabin crew members may ask their airline why they are not adequately protected and if the airline will take measures. Lufthansa's workers' council for the cabin "PV Kabine" got active already in 2020. PV Kabine proposed [14] its management to introduce a half mask Dräger X-plore 3300 [15] including filter to the fleet for about 50 € each. This proposal was rejected by Lufthansa's management. PV Kabine also tried to introduce a statement into Lufthansa's Flight Safety Manual to clarify the use of (personal) protective breathing equipment. A text proposal was rejected by Lufthansa's management. This meant that Lufthansa's management did (does) not want their cabin crew to protect themselves in case of smoke in the cabin. Apparently, the airline defines the duty of the cabin crew to serve passengers as unprotected as the passengers are themselves!

SOCIAL IMPLICATIONS

Passengers may confront and challenge airlines flying Airbus aircraft with Airbus' official advise [16] about how cabin attendants should protect passengers from poisonous smoke: "Use wet towels, a wet cloth, or a head rest cover to reduce some of the effects of smoke inhalation. Instruct passengers to hold the wet towel/cloth over their noses and mouth and breathe through it."

ORIGINALITY

No comparable text seems to be published.

References

- [8] <https://perma.cc/GSZ7-WVD4>
- [9] <https://perma.cc/DW6Z-Z68Z>, [10] <https://perma.cc/399W-CAAM>
- [11] <https://perma.cc/TCU7-EY9W>, [12] <https://perma.cc/Q2GZ-787D>
- [13] <https://perma.cc/E2BY-7NW8>, [14] <https://perma.cc/5ZTE-MUPX>
- [15] <https://perma.cc/U3SB-5J5H>, [16] <https://perma.cc/K5DN-PDDV>