

## Cabin air quality

### Background

Cabin air in modern commercial jet aircraft (excluding Boeing 787) is taken directly from compressors in the engine compartments without filtering. Occasionally, oil fumes from the hot section of the engine leak into this air. This has been recognized by Regulation Authorities, scientists, airlines, occupational doctors, oil manufacturers, and crew unions. However, consequences of such leaks are not unanimously accepted.

Differentiation needs to be made between safety concerns resulting from an abnormal situation (fume events) and potential long-term health effects. This Briefing Leaflet focuses mainly on the safety case resulting from a fume event, as more research on the possibility of long-term health effects is needed.

When a fume event occurs, cabin air contamination can cause short-term physical effects which compromise flight safety.

### Certification specifications

The airworthiness design standards FAR 25.831 (U.S.) and CS 25.831 (Europe) contain ventilation specifications. Both of these state that: "Crew and passenger compartment air must be free from harmful or hazardous concentrations of gases or vapors". This condition must be met at initial design certification as well as an ongoing basis known as 'continuing airworthiness'.

There is continuous research on and development of filtering systems (both from the bleed and in re-circulated air) and detectors (real time, airborne). When a proper filtering system or detector for fume event becomes available, IFALPA encourages fitting of these devices into commercial jet aircraft.

### Are crew members exposed to health risks?

According to a cabin air sampling study performed in BAe146, A320 and B757 cabins for the UK Department for Transport by Cranfield University and published 2011, various hazardous chemicals have been found (e.g. toluene, tri-butyl-phosphate (TBP) and tri-cresyl-phosphate (TCP)). During pre-flight inspection, a crewmember should avoid excessive exposure to the exhausts of ground power units and warm engines. A fume event may cause short-term physical effects including irritant effects (eye, nose, and throat irritation, respiratory symptoms) and Central Nervous System effects (loss of memory, poor concentration and coordination, and confusion). More research is needed on the long-term health effects.

### Crew action

As the inhalation of fumes/smoke may lead to incapacitation, the first action in the event of smoke or fumes in the flight deck should be for the flight crew to don oxygen masks. If during flight it appears that both pilots are suffering from some form of incapacitation or that one pilot appears to be in any way incapacitated for no obvious reason, then the flight crew should don oxygen masks without delay. Fumes can be invisible, and/or be experienced by unexplained odor, e.g. wet socks or blue cheese. In addition, there might be a false perception that a smell has gone after a short period of time due to the adaptation of sense of smell.

Operations manual procedures should contain detailed instructions to crews on the necessity to use oxygen masks at 100% whenever contamination is present or suspected. Also, checklists should refer to Smoke/Fire/Fumes instead of only to Smoke/Fire.

Cabin crew should regularly monitor the flight deck, but this should not be to the detriment of other emergency procedures such as dealing with cabin smoke or fires, especially where only one cabin crewmember is carried. Incapacitation procedures should be practiced during recurrent training and case-based studies should be discussed at joint flight/cabin crew safety training. The potential for a smoke/fumes event to adversely affect the subsequent operating effectiveness of the flight or cabin crew must be considered.

### ***Flight and cabin crews are advised to take the following post-flight actions following a smoke/fumes incident:***

- ▶ Review of the in-flight incident by the aircraft commander which should include consultation with the flight and cabin crew;
- ▶ Determine whether any crewmember felt unwell, or whether their performance was adversely affected; and
- ▶ Require any crewmember who felt unwell, or felt their performance was affected, not to operate as a member of the crew until they have been assessed as fit by a medical practitioner.
- ▶ Follow the recommendations of your doctor, airline, and pilot association.
- ▶ Report the event via an Air Safety Report (ASR); and
- ▶ Make a technical log book entry.

## The need for research

The quality of cabin air is a matter of great concern; however, lasting solutions require that the entire industry works together.

There have been some preliminary studies about the biomarkers of fume events, and further studies may clarify the issue. More studies are needed especially on the long term health effects. In addition, studies on the toxicity of engine oils, hydraulic fluids and deicing fluids are needed. However, IFALPA insists that this research must be:

- 1) Based upon robust, sound, and broadly accepted scientific principles
- 2) Reproducible
- 3) Subject to peer review

As soon as results based on this scientifically sound research are available, the Federation will further develop its position.