ECA
Piloting Safety

ECA Position on Cabin Air Contamination

Due to the design of engines in combination with bleed air systems, oil fumes may enter the air-conditioning packs and pollute cabin air. As air flowing through the bleeds is not filtered, cabin air can be contaminated by chemicals from engine and hydraulic oil. This has been recognised by Regulation Authorities, scientists, airlines, occupational doctors, oil manufacturers and crew associations.

When it comes to the consequences of such leaks, it is important to make distinction between possible safety concerns resulting from abnormal situations (fume events) and potential long term health effects.

This ECA position focuses on the safety case resulting from a fume event, as we wait for more research on the possibility of long term health effects. At the same time, ECA proposes to strengthen existing safety barriers to further mitigate the safety risks related to fume events and to allow for a better and more systematic identification of such incidents. Filtering and detections systems, crew training and more explicit harmonised operating procedures/check lists for fume events are part of this, as well as systematic reporting of such incidents to the company and authority.

Also, in order to raise awareness with regulatory bodies at European and national level, a risk assessment needs to be performed to quantify the magnitude of the problem together with a study of sufficient power to characterise fume events (inhalation study). As long as research on long-term health effects is not conclusive, the basic principle guiding the ECA position is the application of the ALARA principle (As Low As Reasonably Achievable).

The Safety Case

When a fume event occurs, cabin air contamination can cause short term health effects which may compromise flight safety. The crew in such a case has to follow the relevant operating procedures and checklists which stipulate the donning of the oxygen mask, assure 100% oxygen supply to operating crew and then terminate the flight as soon as possible.

In order for the crew to act correctly when such an event occurs, the pilots should be given basic education so as to recognise and distinguish the different sources of fumes. Such basic education of the crewmembers should include a list of symptoms they could encounter in the case of a fume event.

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To facilitate correct and systematic reporting and to quantify the magnitude of the problem, a comprehensive, open and centralised reporting system would be required. This would allow monitoring and analysing of fume events on the European level.

New Technology – Addressing Cabin Air Contamination

Over the last years there have been continuous technical improvements addressing cabin air contamination:

- ECA is aware of the development of detection systems. These assist pilots in their decision-making and can help airlines to avoid diversion costs in the case of false negatives. To comply with EASA's CS25.1309(c), such detection devices should already have been installed. CS25.1309 states that «information concerning unsafe system operating conditions must be provided to the crew to enable them to take appropriate corrective action» and notes that «a warning indication must be provided if immediate corrective action is required.»
- Electrical packs that could be installed on future versions of aircraft types have been developed. The manufacturer announced they will be integrated and flight-tested on a modified ATR 72 and an A320 before the end of 2015.
- An intermediate mid-term mitigation measure could be to filter the air. To date, the B757 is the only current aircraft that can be fitted with bleed air filtration and for which EASA has certified a supplemental type certificate. Although these bleed air filters are not 100% effective, they are a more promising alternative than simple recirculation filters (which do little to alleviate the actual problem).
- Furthermore, EU regulations state that the employer must take the necessary preventive measures and risks must be eliminated or reduced to a minimum following the 'hierarchy of prevention' measures (EU Directive 89/391/EEC Article 6). The hierarchy of prevention is a well-established and mandatory Health & Safety practice, by which the EU sets out a priority-based flow-chart to avoid workplace exposure. Accordingly, in any workplace design the first step would be to eliminate the risk at the source. When this first step has been carried out, but the risk is still present, then can 'collective protection' measures be applied. Only as a measure of last resort, can personal protective equipment be considered.
- Some, such as the Boeing 787's bleed-free technology solve the problem at the source, by using external air inlets instead of bleeding air from the engines.

ECA therefore calls for the following:

- Detection and warning systems in line with EASA regulation CS25.1309 should be installed on all aircraft. Such monitoring systems have already been recommended by other bodies such as the ASHRAE engineering committee (2007), the Australian Senate inquiry (2000), the US national Research council (2002) and the UK AAIB (2004). ECA points out that the Safety Recommendation 2007-02 from the UK AAIB to EASA and Safety

ECA calls for improvements to be made to existing flight and reporting procedures as well as introducing appropriate job specific training for all stakeholders. It calls for continuous development and application of new technologies that can assist in further reducing the occurrence and effects of fume events. Studies need to be run to ascertain whether long term health effects do exist. In the meantime, the As Low As Reasonably Achievable (ALARA) principle should guide action and measures in this area.

ECA therefore demands to strengthen existing safety barriers and calls for the following concrete preventative measures:

Technology:

1. Short-term: Real-time detection systems and cockpit warning devices;
2. Mid-term: Bleed-air filtration;
3. Mid-term: Less toxic chemicals to be certified and applied;
4. Long term: Bleed-free aircraft design;

Training & reporting:

5. Short-term:
   a. Basic education for air crews on nature, effect and symptoms of fume events, as well as awareness & safety management training to company;
   b. Improved and harmonised operating procedures/check lists for smoke / fire / fume / smell events, requiring to always don the oxygen mask in such an event;
   c. Improved and systematic reporting of fume events to the operator, based on Just Culture principles, and by the operator – as well as crews – to the authority;

Research:

6. European risk assessment to quantify the magnitude of the problem;
7. Robust inhalation studies (based on aircraft environment);
8. Research on biomarkers specifically for fume events.

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