

BDL

Progress report
Quality of the cabin air
In commercial aircraft
March 2017

Safety is a top priority for air transport. This priority is the responsibility of airlines to ensure that passengers and crews are safely transported. This is also the reason for the German airlines to deal with the topic of "cabin air".

Regarding the topic of cabin air, it has repeatedly been stated in the past few years whether the health of the passengers and crews as well as the safety of the flight could be endangered by the penetration of burned oil residues into the cabin air. It is still important for airlines to know whether there are actually reliable findings from scientific investigations confirming these statements and whether there is a problem that requires changes in flight operations or the maintenance or manufacture of aircraft. Making.

A. Tasks and Responsibilities

In order to ensure safe flight operations, there are binding regulations, tasks and responsibilities for the companies and supervisory authorities in the aviation sector.

1. Tasks of manufacturers

Aircraft are produced on the basis of a tested model and related design data. The manufacturer is thus responsible for giving the airlines an airworthy (ie a fully compliant legal security requirement) aircraft.

2. Tasks of airlines

Airlines must ensure their passengers, employees and aircraft.

(A) Caring for passengers

Airlines take care of the safe transport of their passengers. On the flight, the commander is responsible for the safety of all passengers on board.

B) Compulsory social security for employees

Airlines have an obligation to their employees to take the necessary measures of occupational safety, which influence the safety and health of employees at work. By assessing the risk to the workers involved in their work, the airlines determine which measures of occupational safety and health are required.

(C) Maintenance of airworthiness

After an aircraft has been accepted by the manufacturer in an airworthy manner, each airline must ensure the airworthiness of its aircraft.

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To ensure the tasks specified in a) to c), established legal regulations and procedures are binding:

< Maintenance: The maintenance program, tailored to each aircraft, ensures that possible problems are identified and remedied in advance with the demand for preventive maintenance. Maintenance is carried out by the airlines themselves and by authorized, qualified maintenance companies. If the carrier or the maintenance company establishes states or components which seriously jeopardize flight safety, they must immediately report this to the Federal Aviation Authority (LBA) responsible for them in Germany. The operating license for an aircraft is not applicable if an individually approved maintenance program is not adhered to by an airline.

< Maintenance: Should damage occur despite maintenance which does not guarantee airworthiness, this will be recovered by repair in qualified maintenance companies. If a maintenance operation on an aircraft or a component detects incidents which have led to or are likely to lead to an unsafe condition which is seriously jeopardizing the flight safety, he shall report this to the LBA responsible for him in Germany.

< Air service: Air carriers operate their aircraft according to the basic rules for operation and specify operating procedures in their operating manuals. Existing checklists are to be used by the crews even in emergencies in order to ensure that the defined operating procedures are followed. Airlines and crews fulfill their obligation to report the disturbances to the monitoring bodies, in this case the LBA and, in the case of serious disturbances or accidents, to the Federal Bureau of Aircraft Accident Investigation (BFU). These include "fumes" and "toxic products". This reporting requirement is laid down

in the relevant national and European regulations. The airlines immediately follow up with incidents of smoke or odors in the cabin.

3. Tasks of the supervisory authorities

Safety in air traffic is ensured by strict regulations. Compliance with these regulations is the responsibility of the supervisory authorities. The public authorities approve and supervise the companies involved in air transport. Through regular checks and the evaluation of incoming reports, they have the possibility to detect and prevent security incidents or to restrict or withdraw operating licenses.

B. Past activities and findings

Regarding the topic of cabin air, it has repeatedly been stated in the past few years whether the health of the passengers and crews as well as the safety of the flight could be endangered by the penetration of burned oil residues into the cabin air. It is therefore important to the airlines to know whether there are actually reliable findings from scientific investigations that confirm these statements and whether there is a problem that necessitates changes in flight operations or the maintenance or manufacture of aircraft.

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1. Activities and knowledge of the relevant public authorities

The German aviation industry is regularly informed about the latest and published activities and findings on the subject of cabin air in regular contact with the competent authorities at international, European and national level:

(A) International level The International Civil Aviation Organization (ICAO), which was responsible for setting international standards in civil aviation, held last in 2010 on the subject of cabin air¹ that

< sufficient security systems have already been established,

< no additional measures are required,

< further research on this is nevertheless supported.

(B) European level The European Aviation Safety Agency (EASA), for three years, assessed existing studies, reports and statements and documents from crews, airlines, manufacturers and authorities in order to obtain a comprehensive picture of cabin air quality. It came to the following final results in 2012:

< There are no security gaps. An immediate or general amendment of the existing regulations would not be justified.

< No correlation is found between the health symptoms of some crews / passages and contamination of the cabin air by oil or hydraulic fluid. As long as this is missing, changes to the existing authorization specifications are not justifiable.

< EASA will continue to monitor the issue. Should incidents in the future present a serious threat to safety and health, EASA will take appropriate countermeasures - including the possibility of changing the regulatory framework.

The EASA has consistently maintained this assessment against the air transport industry on a regular basis.

The results of two independent studies on cabin airborne measurements during the flight³ and the toxicity of pyrolysed engine oils⁴ carried out between 2015 and 2017 and initiated by the EASA also confirmed the assessment of the authority:

< The Fraunhofer Institute for Toxicology and Experimental Medicine (ITEM) and the Medical University of Hannover (MHH) analyzed the air samples from the cockpit and the cabin,

1 37th Assembly in October 2010; Report on Agenda Item 46, A37-WP / 371

2 ED Decision 2012/001 / R of 27 January 2012:

<https://www.easa.europa.eu/system/files/dfu/ED%20Decision%202012-001-R.pdf>

3 EASA - Preliminary Cabin Air Quality Measurement Campaign, published on 23 March 2017:

https://www.easa.europa.eu/system/files/dfu/EASA%20CAQ%20Study%20Final%20Report_21.03.2017.pdf

4 EASA - Characterization of the toxicity of aviation turbine engine oils after pyrolysis, published on 23 March 2017:

https://www.easa.europa.eu/system/files/dfu/EASA%20AVOIL_final%20report_final%20version_160217.pdf

Which they took on 69 scheduled flights with eight different aircraft and engine designs. 61 flying flights took place on airplanes with conventional "bleed air" technology and eight flights on the Dreamliner Boeing 787 (bleed free). The measuring instruments were installed both in the cabin and in the cockpit. The measured cabin air quality was similar or better than that in normal indoor spaces, e.g. In schools or schools. Although small amounts of tricresylphosphate (TCP) concentrations in the nanogram range per cubic meter were measured on all aircraft samples, they were never the risk of their "ortho" isomers (oTCP). The air measurements in the Dreamliner surprisingly showed a similar pollutant concentration (including TCP) in the cabin as in the other aircraft patterns. In spite of detected abnormalities, pollutant limits were not exceeded on any flight or substances were found in health-damaging scale. Rather, the concentrations of pollutants measured were orders of magnitude below values which are classified as toxicologically acceptable.

< The Netherlands Organization for Applied Natural Science (TNO) and the independent Dutch Health Ministry (RIVM) responsible for public health and environmental protection pyrolysed various new and used oils at 120-350 degrees and investigated the effects of pyrolysis products The model of the human body. The amount of toxicant-producing substances produced was so low that they can not be absorbed into the organism by intact lung barrier in humans. Exact statements about the meta-bolic effect of industrial chemicals on the human organism can not be made today.

In the interests of the public, airlines, industry associations and industry, the EU Commission is continuing the EASA studies. From 2017-2019, further measurements during the flight and the simulation of cabin air contamination events are to be carried out as well as a toxicological risk assessment method, the characterization of short- and long-term health risks and a risk minimization strategy.

(C) At the national level in 2014, the BFU published a study 5 on the subject of the topic of cabin air. It concludes that there are no relevant restrictions on flight safety through so-called "fume events". The BDL welcomes the BDL and the BDL-organized airlines to further optimize their reporting system. The BFU continued the study in the following years.

In cooperation with the Institute for Prevention and Occupational Medicine Bochum (IPA) and with the cooperation of the airlines from July 2010 to May 2012, the Berufsgenossenschaft für Transport und Verkehrswirtschaft (BG Transport) conducted investigations of urine samples of the fly-

5 BFU - Study on reported events related to cabin air quality in commercial aircraft, May 2014:

http://www.bfu-web.de/DE/Publikationen/Statistiken/Tabellen-Studien/Tab2014/Studie_Fume_Events_2014.pdf

The staff. None of the 332 urine samples of the crews, which, according to their own data, experienced a cabin air event (N = 71) contained metabolic products of the neurotoxic component of the engine oil.

In 2017, BG Verkehr plans to launch a comprehensive biomonitoring of flight assignments. For this purpose, a network of transit physicians at the airport is to take standardized urine and blood samples from crews after cabin air incidents. These are to be analyzed centrally by the IPA. Biomonitoring is designed to investigate the hypothetical causality of the effects of organic solvents, such as n-hexane, on the human body.

2. Insights and activities of the air transport industry

A) Investigations In addition to the above, Cooperations in studies conducted by the EASA and BG transports the German aeronautical industry continues to carry out self-study studies on the subject of cabin air and initiated its own inquiries, including:

< In his 2009 study, the Fresenius Institute concluded that none of the extensive air measurements carried out in the context of the study could be used to detect loads in the cabin air. The small traces of organophosphates in the booth, determined by wiping tests, were subsequently analyzed by the head of the Institute of Toxicology at the Johannes Gutenberg University of Mainz, the toxicologist Prof. Dr. Kaina, which notes that the amount of organophosphates is considered to be safe for health.

< In the case of a series of measurements lasting from 2011-2012 in cooperation with the MHH, air samples were taken during normal operation and subsequently analyzed in the laboratory. None of the 90 individual measurements on different aircraft designs and routes resulted in an exceedance of occupational hygiene standards or occupational health and safety limits. The final assessment of the results by the Umweltbundesamt also revealed that there is no health risk for crews and passengers according to the data situation.

< Two test cases were developed in cooperation with the MHH, which take air samples in the air, which were subsequently analyzed in the laboratory. This should record changes in the air composition during a cabin air event. A suitcase was used on A380 aircraft from April 2013 to March 2015 and the other from November 2014 to May 2015 on A321 aircraft. No overshooting of indoor air quality guidelines or occupational health and safety limits were observed during flights; Even during documented smell events (Smell events). There was neither a health hazard from the cabin air nor a connection to neurotoxic oTCP or other chemical substances in a health hazard.

reporting culture

The German aviation industry is very interested in the fact that the pilots and flight attendants report all incidents relevant to flight safety and safety at work. The airlines are continually raising their crews' awareness of their obligation to provide information, and they support transparent information by the authorities.

< Airworthiness: The BDL affiliates are continually explaining to their crews that serious disturbances must be reported not only to the air carrier for forwarding to the authorities, but also directly to the BFU and in a copy to the LBA.

Given the strong awareness of the crews by the airlines, trade unions / trade associations and reporting authorities in recent years, the number of reports rose. This development is positive because it is a good reporting culture. It is decisive that the number of incidents classified as relevant by the relevant BFU did not rise in the same period.

The airlines are in constant contact with the LBA and the BFU. Since October 2011, the BDL, together with its members, has been conducting annual interviews with the reporting authorities, where the authorities have always confirmed to the airlines proper reporting. In these talks, the unions of cockpit and cabin staff have also been able to participate - the independent flight attendant organization (UFO) since November 2012 and the association Cockpit eV (VC) since November 2013. From their practical experience, Possibilities for further improvement of reporting paths as well as feedback from the BFU to the safety departments of the companies, in order to make them even more efficient and faster.

In the interest of standardizing the reporting procedures for the airlines organized in the association, the BDL had asked the BFU in regular discussions to indicate which individual points the BFU would like to take into account in each case. The BFU 2014 with its o.a. "Study on reported events related to the quality of cabin air in commercial aircraft". Building on this, the Technical University of Berlin in 2016 developed a recommendation for the implementation of a standard reporting procedure, which is currently being implemented by all stakeholders.

< Occupational safety: Together with the VC, the BDL spoke out against BG Verkehr for the development of a standard medical procedure for crews, which is to be applied after suspicion of a cabin air incident. In February 2014, the medical / business services and flight companies of the BDL airlines, together with BG Verkehr, as well as the VC and UFO, agreed on a standard examination procedure after a cabin air event. The BG traffic publishes the procedure on its webpage⁶.

In November 2014, Derselbe Kreis agreed to make crews next to the og. Initial examination also standardized medical follow-up. Since then, the industry has been able to identify potential centers of excellence in Germany.

6 <http://www.bg-verkehr.de/arbeitsicherheit-und-gesundheitsschutz/brancheninfos/luftfahrt/flugbetrieb/MultiLink%20Fume->

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3. Activities of the manufacturing industry

Regardless of the fact that the authorities see no reason to change the existing technology of air supply, the German aviation industry has been working together with the trade unions in dialogue with aircraft and engine manufacturers since 2012 as well as the developers and producers of sensors, filters and oils. The focus of interest is on the standardization and measurement of cabin air quality, the prevention of cabin air pollution, the development of possible sensors and filters in the cabin air supply and the methodology of the air supply.

The German Aerospace Center (BDLI) commissioned the independent German Aerospace Center (DLR) in 2015 to carry out the so-called FuSE study (Fume and Smell Events). For this purpose, To the 800 scientific and official publications of the last thirty years on the subject of cabin air in a complex literature study. The study aims, in particular, to determine the need for further studies on the issue of Ka-binen air. The results will be published in 2017.

C. Dialogue with authorities, trade unions, the trade association and the manufacturing industry

In addition to air transport, the issue of cabin air also affects other actors, such as the competent authorities, trade unions - the VC, the UFO and the United service union (ver.di), the BG transport industry and the manufacturing industry. The BDL therefore has a dialogue with all these stakeholders in the process of dealing with and reconnaissance on the subject of cabin air. In this context, To keep the practice of the reporting system at a high level or to discuss the possible need for further research and development in aircraft technology.