

Motion

tabled by Members of the Bundestag Markus Tressel, Cornelia Behm, Harald Ebner, Bärbel Höhn, Undine Kurth, Nicole Maisch, Friedrich Ostendorff, Hans-Josef Fell, Bettina Herlitzius, Dr. Anton Hofreiter, Sylvia Kotting-Uhl, Oliver Krischer, Stephan Kühn, Ingrid Nestle, Dr. Hermann E. Ott, Dorothea Steiner, Daniela Wagner, Dr. Valerie Wilms and the Alliance 90/The Greens parliamentary group

Stop contaminated cabin air in aircraft

The Bundestag is requested to adopt the following motion:

I. The German Bundestag notes:

Contaminated cabin air in commercial aircraft is a problem. This was once again confirmed by the 38th meeting of the German Bundestag's Committee on Tourism on 21 September 2011, at which there was an expert hearing on this topic. In the recent past, indications of incidents involving contaminated cabin air in commercial aircraft have multiplied. There are three significant problems: cabin air contaminated by oil fumes, ozone or pesticides.

Fume events, which occurs when the cabin air is contaminated by oil fumes, are the most conspicuous incidents. The background to these events is a technical design in which the air for the air conditioning is taken, or bled, from the compressors in the engines. Hence, this is known as bleed air. It can lead to oil fumes from the engines being released into the air that people breathe. The engine oils contain neurotoxic additives. When heated, they become several times more toxic. A seal is the only component separating the oil-covered engine components from the cabin air. These seals are self-sealing: the pressure of the oil makes them seal. On account of the design of these types of seal, at least minor amounts of oil fumes almost always leak into the cabin air when the load changes. For example, the Norwegian National Institute for Occupational Health found that neurotoxins were also present under normal conditions. Inhalation is the most effective type of absorption and can have a significant impact on health. In addition to health hazards for passengers, flight attendants and pilots, this also poses a serious threat to flight safety.

Alongside oil fumes, the hazards caused by ozone have been criticised by the *Berufsgenossenschaft für Transport und Verkehrswirtschaft* [Professional Association of Transport and Traffic] and Vereinigung Cockpit (VC), an association of pilots and flight engineers. While warnings are issued to the population on the ground if ozone thresholds are exceeded, a large proportion of the fleet of German airlines still flies without ozone converters. The crews do not receive information about current ozone levels in the atmosphere, nor are there flying restrictions to avoid high ozone concentration levels. Ozone is considered to be carcinogenic. It is an irritant gas with a negative impact on the mucous membranes and the respiratory tract.

The use of pesticides and special pyrethroids in aircraft cockpits and cabins is also a problem. These synthetic insecticides are used to prevent mosquitos or epidemics such as malaria. Their use can also lead to the poisoning of aircraft personnel and passengers.

Moreover, the extent of the danger caused by a combination of these three hazards cannot be calculated from the three individual contamination sources. Hence, there are no regulations on occupational health and safety either. There are no cabin air quality standards based on the three above-mentioned hazards.

The Federal Government's activities have been too passive in almost all of these areas to date. The work of the Federal Aviation Office (LBA) has been particularly poor. According to current regulations, the LBA's responsibilities include authorising and monitoring technical services (such as maintenance systems) for commercial airlines. The LBA can also take on tasks on its own initiative or to assist the European Aviation Safety Agency (EASA). In addition, the LBA produces maintenance programmes, issues airworthiness directives, and collaborates on national and international aviation regulations. Aviation medicine, including approval and monitoring of aeromedical centres and experts, are also among its tasks. It is only partially correct to say that EASA is responsible. To date, the LBA has allowed airlines to report cases of incidents subject to mandatory reporting only after being requested to do so. No penalties have been imposed so far.

II. The German Bundestag calls on the Federal Government:

- To work actively on national, supranational and international provisions to reduce the health hazards caused by pesticides, ozone and engine oils;
- To prohibit the use of neurotoxic engine oils and, given the toxicity of inhaling heated oils, to support the development of biomarker technology and less toxic oils;
- To lobby on the supranational and international levels for the air supply in aircraft to be designed on the ram-air principle, in which the cabin air is sucked in via air ducts on the shell of the aircraft, and for this to be stipulated and implemented as a technical norm for the construction of new aircraft;
- To support the development of bleed air filter systems for organophosphates and other harmful substances to market readiness, and to create a mandatory norm to ensure that these systems are installed in all commercial aircraft with a bleed-air system;
- To support research and development on real-time bleed-air warning systems and filter technologies, and to make it mandatory for airlines and aircraft manufacturers to install measuring and control systems for dangerous substances such as, for example, sensors to measure organophosphates (and other toxins) in the cabin air to warn the flight crew in time in the event of an incident;
- To ensure that there are improved maintenance procedures as regards bleed-air contamination in order to ensure that leaking engine oils are identified and removed by the aircraft operator, and to monitor these maintenance procedures more closely, for example by random inspections of the seals and the levels of cleanliness of the bleed-air ducts, etc;
- To review all aviation regulations in terms of health protection and occupational safety and to require that they be observed, for example, by including the cabin air as a compulsory category in the hazard analyses for jobs in cockpits and cabins;
- To commission comprehensive epidemiological studies on the harm caused by contaminated cabin air and other toxicological research on the impact on health of the inhalation of organophosphates, and to have blood tests to detect the presence of organophosphates in the human body developed;
- To create clarity about what constitutes an incident and what constitutes a serious incident. Events involving contaminated cabin air are definitely serious incidents and must therefore be reported to the German Federal Bureau of Aircraft Accident Investigation (BFU). In such instances, the LBA is relieved of its duties in order to avoid overlapping structures and to comply with the BFU's intent to identify the cause(s) of an accident. The confusion about the LBA and BFU's respective duties must be resolved. Regulation (EU) No. 996/2010 must

be applied consistently in such cases. This means that every person involved reports the incidents to the responsible institution. It must not be permitted that incidents are initially only communicated internally within the company;

- To impose penalties as a deterrent on aircraft operators that fail to report an incident, delay reporting, or do not fulfil their duties to provide information or assistance;
- To set up a working group with the BFU, DLR German Aerospace Centre, the LBA, VC, the UFO [Independent Flight Attendants' Organisation], the trade union ver.di, the Global Cabin Air Quality Executive and EADS/Airbus as members; this group should agree on further research work and provide the Federal Government and the Bundestag with authoritative information on further options for action;
- To undertake an unambiguous classification and amendment of the “smoke and fumes” terminology and to extend the definition of the terms “smell” and “odour”. German aircraft crews must be informed that contaminated cabin air referred to as “fumes” can be both visible and invisible and that it must be reported immediately under Regulation (EU) No. 996/2010. It must be ensured in this context that the report is subject to data protection regulations under all circumstances and that it does not have any employment consequences for the person reporting the incident. German aircraft crews must be trained to deal with such incidents. In the event of oil contamination, pilots should be requested to put on an oxygen mask in order to prevent possible incapacitation;
- To prohibit the operation of aircraft following oil contamination of the air supply in line with Airworthiness Directive 2001-349/2 until an inspection has been conducted and the agreed follow-up steps implemented. This process must be monitored more closely and penalties must also be imposed if it is not adhered to;
- To narrow down the symptoms of aerotoxic syndrome in line with international findings and to recognise it as an occupational disease, as well as to raise awareness of it among the respective occupational doctors.

Berlin, 25 October 2011

Renate Künast, Jürgen Trittin and the parliamentary group

Explanatory memorandum

Adverse health effects of insecticides

Insecticides are used to prevent epidemics and to protect endemic species. There is a warning printed on the spray cans used in cabins by some international airlines stating that these sprays should not be used in the cockpit. This is, however, done in practice. The health hazards of pest control on board aircraft in international air transport was also pointed out in a minor interpellation by Member of the Bundestag Jan Mücke, who is now Parliamentary State Secretary at the Federal Ministry of Transport, Building and Urban Development responsible for this area, and by the FDP parliamentary group (cf. Bundestag printed paper 16/12790). At the time, the Federal Government unambiguously concurred with the opinion contained in the assessment by the Federal Institute for Risk Assessment (BfR), which declared the use of the standard in-flight spraying procedure to be a health risk for cabin occupants. However, it cannot be ruled out that such procedures are practiced.

At the time, Member of the Bundestag Jan Mücke and the FDP parliamentary group stated the following: “The airlines are obliged to carry out pest control on board aircraft on certain flight routes. The aim is to prevent insects that could carry pathogens from being carried from the country of departure. Initially, short-term

insecticides were sprayed in the presence of passengers and crew in the cabin before landing (in-flight spraying).” This practice “led to repeated incidences of medical complaints among passengers. A study by the Fraunhofer Institute for Toxicology and Experimental Medicine (ITEM) in 2004 confirmed that this procedure poses a health risk. The insecticides used can enter the respiratory tract in an atomised form and land on the skin, and affect the nervous system. Nevertheless, the substances contained in the sprays are still classified as not harmful by the WHO (World Health Organization).” The minor interpellation also referred to a disinfection method developed by the BfR in 2005 that is “much better tolerated by passengers and crew”.

In summary, the Federal Government’s response determined that, firstly, in-flight spraying poses health risks to aircraft occupants.

Secondly, the question of whether insecticides are used is not only a political question. Only three states prescribed its use. In fact, the destination airport decides whether aircraft disinfection is required or not. The Federal Government underlined that the first sentence of the second paragraph of Annex 5 in the WHO International Health Regulations (2005) on the eradication of insects in aircraft was merely a recommendation.

Thirdly, given the lacking will of airlines and the Federal Government to investigate cases of contaminated cabin air, it is not surprising that the Federal Government does not have information about what is the average percentage of people on board aircraft in which in-flight spraying disinfection is conducted that suffer from medical symptoms as a result.

Fourthly, the Federal Government wanted to stop German airlines from in-flight spraying even though there was little information on its practical application, and a lack of monitoring structures.

Fifthly, the various activities on the international level and the study by the BfR show that far greater resolve has been demonstrated in cases of cabin air contaminated by pesticides than in cases of cabin air contaminated by ozone or oil fumes.

Finally, the Federal Government’s response underlined its support for “chemical-free methods, for example air streams at the aircraft doors” in addition to the use of pesticides. Accordingly, the Federal Government is called upon to undertake further endeavours to prevent the danger to passengers and flight personnel presented by the use of pesticides. As the problems have been known for years and researched by federal institutes, the policy options are well known. Further investigation and resolution on the international level are urgently needed.

Adverse health effects of ozone

On 8 September 2011, the *Berufsgenossenschaft (BG) Verkehr* [Professional Association of Transport] gave a presentation in which it stated that “ozone in commercial aircraft is an occupational health and safety problem!” This was based on a large number of measurements in which the thresholds, which are not particularly appropriate in the first place, had repeatedly been exceeded. Ozone is not only considered to be carcinogenic, but is also an irritant gas with adverse effects on the respiratory tract and mucous membranes. In a statement on the expert hearing of 21 September 2011, the Vereinigung Cockpit (VC) agreed with the recommendation by the BG Verkehr that ozone convertors should be installed on all short and long-haul aircraft. “While warnings are issued to the population on the ground if a threshold of 180 micrograms per cubic metre is exceeded, a large proportion of the fleet of German airlines still flies without an ozone convertor. The crews do not receive information about current ozone levels in the atmosphere, nor are there flying restrictions, such as flying at a lower altitude, to avoid high ozone concentration levels. Ozone is considered to be carcinogenic.”

The VC calls for ozone convertors to be a prerequisite for the new registration of an aircraft. The use of aircraft without a convertor on routes that exceed the thresholds should be prohibited and the airlines should be obliged to install ozone convertors on existing aircraft. [...]” (cf. committee printed paper 17(20)28a). This demand should be met to the greatest possible extent.

Adverse health effects of oils

In addition to the health risks posed by ozone and insecticides, the inhalation of heated oil fumes is extremely dangerous. The commercially available engine oils contain neurotoxins such as tricresyl phosphate (TCP). This has been confirmed by many organisations. For example, the US Federal Aviation Administration (FAA) admits that exposure to oil fumes can have a detrimental effect on the cockpit crew and flight safety and thus lead to an unsafe operational situation. Engine manufacturers such as Rolls-Royce have also described oil leaks in the cabin air as dangerous. In its printed paper 16/12023, the Federal Government also stated that the inhalation of engine oil fumes can be harmful. The use of neurotoxic engine oils should therefore be prohibited. Apart from danger to health, there are considerable flight safety concerns. In view of the inhalation toxicity of heated oils, it is important to promote the development of biomarker technology and less toxic oils, (cf. committee printed paper 17(20)28d).

Technical design / ram air

The bleed-air system is the reason why oil fumes can leak into the cabin in the first place. A technical design that takes air for the air conditioning from the compressors in the engines has become standard since the middle of the previous century. This promised cost benefits. However, the impact of oil fumes on health and flight safety was not taken into account (cf. inter alia committee printed paper 17(20)28d).

A technical solution has not been established so far on account of complicated industrial practices. Airlines order their aircraft directly from the manufacturers but enter into separate contracts with engine manufacturers. It is thus common practice that the same type of aircraft is fitted with different engines by the manufacturers in line with the airlines’ wishes. Aircraft manufacturers have designed their products so that engines can be exchanged quickly, also to facilitate the required maintenance work. The air is extracted from the compressors in almost all current standard aircraft models irrespective of the engine manufacturer. Hence, manufacturers tend to regard engine manufacturers as being responsible in cases of engine damage that can, for example, lead to oil leaks. Engines and engine oils are also made by different manufacturers. The engine oil used depends in turn on the engine or the airline. This means that there are several options for regulatory policy. The easiest is to ban engine oils with neurotoxic additives. However, airlines could decide to use their power as consumers and only purchase this type of engine oil. As this has not happened so far, there is obviously a need for regulatory policy. The Boeing 787 features a technical innovation, or rather a rediscovery. In this model, the cabin air is sucked in via air ducts on the shell of the aircraft using the ram-air principle (cf. inter alia committee printed papers 17(20)28, 17(20)28a and 17(20)28d). This technical solution was welcomed by all of the parliamentary groups at the expert hearing on 21 September 2011. According to Regulation (EC) No. 216/2008, EASA is responsible for authorising improvements resulting from design measures. The Federal Government should therefore work on this level to achieve such results. However, the ram-air principle is more of a long-term solution, as the aircraft models used by airlines cannot be converted to it. Nonetheless, the aim should be to set deadlines. The average operational lifetime of an aircraft is around 30 years. Orders for planned aircraft models or for aircraft in production are placed between two to five years in advance. Hence, relatively long periods are required in order to eradicate the bleed-air system. The parliamentary group of Alliance 90/The Greens

calls for a stop to new aircraft with a bleed-air system on the market from 2015. From 2040, no aircraft with a bleed-air system should be allowed to fly.

Filters

In view of the long-term planning periods needed to change aircraft designs, filter systems which can improve the quality of the cabin air should be used along with oils that do not contain neurotoxic additives. However, the focus here should not just be on TCP. Other substances such as beta-naphthylamine, ozone and other carcinogens or otherwise harmful substances should also be filtered out of the bleed air effectively and prevented from entering the cabin air.

According to manufacturers, some effective products are already available but there is no demand for them. Support should nonetheless be provided to develop bleed-air filter systems for organophosphates and other harmful substances to market readiness. On account of the lacking will to take effective action, mandatory standards should also be established to ensure that these filter systems are installed in all commercial aircraft with a bleed-air system.

Warning systems

So far, commercial aircraft do not have a warning system to show when contamination has occurred. This is a particular problem in the light of the circumstances described as follows by the VC: “The smell noticed by the crew or passengers during a fume event can vary greatly and is not always linked to the cause. To date, odours such as “smelly socks”, “a changing room”, “a sweet smell of oil”, “vomit”, “a wet dog” or “an acrid, intense or pungent smell” have been described. As the olfactory sense adapts very quickly to smells, it cannot be reliably determined if a smell has disappeared” (cf. committee printed paper 17(20)28a).

This underlines once again the importance of warning and filter systems in this context. Unless an incident involves visible fumes, which is a very rare occurrence, smell is currently the only parameter that indicates that the cabin air has been contaminated. Support should therefore not only be given to filter systems but also to the research and development of real-time bleed-air warning systems. For reasons of occupational health as well as flight safety, airlines and aircraft manufacturers should be obliged to install measuring and control systems for hazardous substances, such as sensors to measure organophosphates (and other toxins) in the cabin air, in order to warn the crew in time in the event of an incident.

Maintenance

In 2009 SGS Institut Fresenius GmbH determined TCP contamination of air ducts using swab samples. The scientific method of using swab samples was disputed. The message from science and industry was that TCP could also be present in other substances in the cabin. This is not reassuring. The presence of TCP in the cabin was thus not ruled out although people should not be exposed to neurotoxins and there are specific warnings against inhaling or touching these toxins. However, another fact was decisive. Certain aircraft were tested several times within close time periods. The levels measured in these samples within this time period increased dramatically by a factor of over 1,000 in comparison with the original level. Despite criticism of the scientific method, this is undoubtedly a result of bleed-air contamination. This hypothesis has since been backed up by other studies such as that by the Norwegian National Institute for Occupational Health and studies from the US in which metabolites were found in people’s blood although they had never even experienced a fume event.

Apart from the bleed-air ducts, which must be cleaned after a certain number of flight hours defined by experts and whose maintenance and cleaning procedures are required to be randomly tested, there is also the issue of seals. These seals are self-

sealing: the pressure of the oil makes them seal. On account of the design of these types of seal, at least minor amounts of oil fumes almost always leak into the cabin air when the load changes. Given the enormous forces in flight operations, particularly during take-off and landing, and the increasing number of incidents involving contaminated cabin air, it is evident that the current maintenance standards and inspections by the LBA are not sufficient. According to current regulations, the LBA's responsibilities include authorising and monitoring technical services (such as maintenance systems) for commercial airlines. The LBA can also take on tasks on its own initiative or to assist the European Aviation Safety Agency (EASA). In addition, the LBA produces maintenance programmes, issues airworthiness directives, and collaborates on national and international aviation regulations. Aviation medicine, including approval and supervision of aeromedical centres and experts, are also among its tasks. Hence, it is absolutely inappropriate for the Federal Government to pass total responsibility for this issue to EASA (cf. inter alia Bundestag printed paper 17/5371). As underlined by the European Commission, the individual Member States are responsible for implementing EU health standards. This was also expressed in the written question E-3044/10 by the Member of European Parliament Michael Cramer (The Greens/European Free Alliance parliamentary group) to the European Commission. Certain types of aircraft, which the information available has shown to be particularly prone to incidents, should be subjected to additional checks. It would make sense to set up a working group that works closely with the BFU, to find methods that would fully ensure smooth flight operations without contaminated cabin air resulting from maintenance deficiencies.

Occupational health and safety

In the written question E-3044/10, the European Commission stated that the Member States are responsible at the EU level for applying national legal regulations to implement Directive 89/391/EEC on measures to improve the health and safety of workers at work, as well as Directives 98/24/EC on chemical agents and 2004/37/EC on carcinogens and mutagens. Under these directives, all employers are generally obliged to safeguard workers' health and safety in all work-related aspects.

There are considerable differences here between the law and its implementation. In a joint press release issued in 2010 (cf. <http://www.verdi.de/presse/pressemitteilungen/++co++55dd2326-6344-11df-701d-0019b9e321cd> – available in German only), all employee interest groups (VC, ver.di and UFO) called for “comprehensive action in the interests of preventative health and safety for crews and passengers. The current regulations on health protection and safety at work – to the extent that they exist – should therefore be reviewed, adapted or redrafted on this basis. For example, cabin air should be included as a compulsory category in the hazard analyses for jobs in cockpits and cabins.

Where cabin air is contaminated to such an extent that it causes symptoms such as irritation of the respiratory tract, mucous membranes or the skin, tiredness, symptoms of poisoning, or other medical complaints, the airworthiness directives on ventilation systems (FAR/CS 25.831 a/b) have not been met. In such cases, the aircraft is not airworthy. In 2000, BAE Systems made the following statement to the Australian Senate: [BAE, 2000] “There is absolutely no doubt in our mind that there is a general health issue here. The number of people who have symptoms indicates that there is a general issue... It is very clear that there is an issue here which not a flight (sic) safety issue... With the weight of human evidence and suffering, which is quite clear, there must be something there...” (cf. committee printed paper 17(20)28d. p. 23).

Epidemiological studies

In Germany there are currently no adequate research findings on the causes, effects and propagation of health-related conditions and incidents arising from

contaminated cabin air, nor has further toxicological research on the impact on health of inhaling organophosphates been carried out, nor have blood tests been developed to detect organophosphates in the human body. This has serious consequences, including an extremely unclear pathological definition, the lack of recognition of the condition as an occupational disease despite the large number of people affected, and the frequent misdiagnoses by occupational doctors. However, one thing is clear: as a testing method, the urine tests conducted to date (cf. committee printed paper 17(20)28c) are completely flawed. Hence, it is not surprising that these tests do not produce results or prove that contaminated cabin air has been harmful to health (cf. inter alia committee printed paper 17(20)28d, p. 18). The blood testing methods developed by institutes such as the University of Nebraska-Lincoln and used to examine passengers in cooperation with the University of Washington showed that 50 percent of the people tested had metabolites in their blood as a result of a flight, without having experienced a fume event (cf. inter alia *Der Spiegel* 38/2011, p. 110). This is an extremely reliable method. The Federal Government should also have blood tests conducted along these lines and provide appropriate funding and commission research projects for this purpose, for example via the Federal Institute for Risk Assessment (BfR).

Competences

Under the reporting system for incidents laid down in EU law and the statutory regulations of the individual Member States, toxic and harmful fumes, which can be visible or invisible, must be reported to the aviation authorities.

The LBA and BFU are the responsible federal authorities in Germany. The LBA performs an extremely wide range of tasks. Its technical tasks include authorising and monitoring technical services (maintenance systems), commercial airlines and flight training schools. The LBA can also take on tasks on its own initiative or to provide support to EASA. In addition, the LBA produces maintenance programmes, issues airworthiness directives, and collaborates on national and international aviation regulations. Aviation medicine, including approval and monitoring of aeromedical centres and experts, are also among its tasks. On the issue of contaminated cabin air, the LBA's performance to date has been most unsatisfactory. A report by German TV station NDR on 12 August 2010 (cf. <http://www.ndr.de/unternehmen/presse/pressemitteilungen/pressemeldungndr6498.html>) quoted a confidential paper by the German Airline Association (BDF) that it had received. According to this document, the German airlines fear "additional momentum" if the Berufsgenossenschaft Verkehr [Professional Association of Transport] or the BFU "conduct further studies". There was no further mention of the LBA, the direct supervisory body until then, in the paper. With Regulation (EU) No. 996/2010, the BFU's competences have now been extended.

Under article 5b of LuftVO, the German Aviation Regulation, "Reporting incidents affecting safety", smoke and fume events must be reported to the LBA and BFU. Smoke and fume events are incidents in which oil mixes with the very hot compressed air extracted from the engines and enters the cabin as fumes or smoke. According to information from the German TV station WDR, the LBA agreed to delegate the compulsory reporting of incidents in line with article 5b of the German aviation regulations from the pilot to the airline involved. The investigation and prevention of accidents and incidents has changed in civil aviation under article 9 of Regulation (EU) No. 996/2010, which repealed Directive 94/56/EC. Now "any person involved who has knowledge of the occurrence of an accident or serious incident" is obliged to notify the competent safety investigation authority "without delay". In this case, the BFU rather than the LBA is the competent authority. To date, the BFU has stated that the authority reserves the right to decide on how a serious incident should be classified. However, incidents of the above-mentioned type (smoke/smell reports) were only reported by the airlines involved following a considerable delay – if they were reported at all.

Put simply, the LBA is currently responsible for fume events that are classified as incidents. If crew members are incapacitated as a result, the event is classified as a

serious incident and the BFU is the competent authority. There have already been cases in which both incapacitation of crew members and oil fumes were registered. However, there have been no reports of serious incidents because of the lack of recognition of the “evidence” to date. Under the new Regulation (EU) No. 996/2010, the BFU reserves the right to classify events reported as incidents as “serious incidents”. The problem of underreporting and delays in reporting incidents seriously disrupt the authority’s investigative endeavours. Indeed, events and incidents that must be reported are only registered following a request to do so (cf. Bundestag printed paper 17/5371).

The dangers of a fume event, smoke incident or similar situation should nonetheless not be underestimated. The current classification, which differentiates between incidents and serious incidents, is not helpful. The BFU should be the competent authority for all incidents involving contaminated cabin air. Overlapping structures should be avoided here. A clear definition of competence would tackle the problem of underreporting effectively. The BFU’s increased competence would also improve its investigative work, as it can be ensured that events can be reported promptly and investigated accordingly. So far, there have been delays, which mean that crews and passengers cannot be medically examined within the necessary timeframe.

The Greens call for a ten-percent increase in BFU funding in order to provide one to two new permanent posts, as well as instruments/materials/equipment for investigations. This ten-percent increase in BFU funding should therefore be included in the budget negotiations for 2012 (departmental budget 12, chapter 16, title group 04, title 671 41-579). The funding comes from an increase in revenue in departmental budget 12, chapter 16, title 112 01-759 from the consistent penalties imposed on airlines and a to shift funds between items, for example cuts in the staff budget at the LBA (F 428 01-759). The large planned increase of business trip costs under F 527 01-759 could perhaps be cut. Furthermore, the reduced competence of the LBA will mean that further costs can be cut, funds which could then be used for higher expenditure on staff and the provision of instruments at the BFU.

Penalties

The Federal Government did not even regard events that were only reported upon request as a reason to impose penalties. According to article 23 of Regulation (EU) No. 996/2010, the penalties imposed must be “effective, proportionate and dissuasive”. Accordingly, the Federal Government should impose an immediate fine for failure to report incidents subject to mandatory reporting. The initiation of administrative offence proceedings without a fine should not be tolerated in cases where the flight safety and health of the passengers and crew were endangered.

Failure to observe the requirement to report an incident in line with article 5, paragraphs 1, 2, 3 or 5 of the German Aviation Regulation (LuftVO) is an administrative offence in terms of article 43, paragraph 1, number 10 of the German aviation regulations in connection with article 58, paragraph 1, number 10 of the German Civil Aviation Act (LuftVG). Competence for this matter already lies with the BFU. In this context, there is thus a further argument for simplifying the reporting structures by restricting them to one organisation.

Working group

The work of the Federal Government to date has certainly not featured an active willingness to investigate incidents. Only the BFU has shown, through various discussions with scientists and business people, that it is tackling this problem seriously. A working group chaired by the BFU should deliver results and strategies for the Federal Government’s future work. Apart from the BFU, DLR German Aerospace Centre, the Federal Aviation Office, VC, the UFO association, the union ver.di, the GCAQE (Global Cabin Air Quality Executive), EADS/Airbus, the *Bundesverband der Deutschen Luftverkehrswirtschaft* [Federal Aviation Industry Association] and BARIG (Board of Airline Representatives in Germany) should be involved in this group. The committee should inform the Federal Government and the German Bundestag about further possible courses of action every two months. The committee should also prepare work on the international and supranational

level. Furthermore, it should propose binding guidelines for the negotiations. It should be ensured that the VC's vote is given double weighting on account of its high level of responsibility and credibility on this topic.

Terminology and its consequences

Employees and experts have criticised other terminological issues in addition to the differentiation between an incident and a serious incident. They suggest amending the smoke and fumes terminology to include the terms “smell” and “odour” (cf. inter alia committee printed paper 17(20)28a). German aircraft crews are to be informed that the contaminated cabin air presently referred to as “fumes” can be both visible and invisible and that it must be reported immediately and by every person involved under article 9 of Regulation (EU) No. 996/2010. It must be ensured that the report is subject to data protection regulations under all circumstances and that it does not have any employment consequences for the person reporting the incident. German aircraft crews must be trained to deal with such incidents. In the event of oil contamination, pilots should be requested to put on an oxygen mask in order to prevent possible incapacitation, as “there is no doubt that exposure to contaminated cabin air affects flight safety” (committee printed paper 17(20)28d, p. 13). In this context, we would like to draw attention once again to the problems concerning the sense of smell.

The use of aircraft following oil contamination involving the air supply is to be prevented until an inspection and agreed follow-up steps have been conducted. Even the LBA, which has not otherwise been a particularly proactive authority, already pointed this out in an airworthiness directive issued on 13 December 2001 and again on 17 April 2003 (LTA No. 2001-349 and 2001-349/2). This also stated: “An oil leak in the air conditioning, engines or auxiliary power unit areas, as well as traces of oil in the sound insulation material of the connected air ducts in the mixer/filter in the back cargo hold can lead to harmful contamination of the cabin air and cause symptoms of poisoning among the crew” (LTA No. 2001-349/2).

Occupational disease

In a paper produced by the Research Services of the German Bundestag in 2010 it was stated that “the symptoms [include] chronic fatigue, fainting, seizures, neuromuscular pain, weakness, breathing difficulties, cardiac cycle problems, skin problems and loss of concentration”. The Vereinigung Cockpit (VC) listed further problems (cf. committee printed paper 17(20)28a): “If an incident leads to the cabin air being contaminated with poisonous organophosphates and these are inhaled, this may cause the following effects on the health of those involved: tiredness, tunnel vision, shaking and trembling, problems with balance, seizures, loss of consciousness, problems with memory, headaches, tinnitus, drowsiness, dizziness, confusion, cognitive problems, feeling of having been poisoned, nausea, sickness, vomiting, diarrhoea, irritation of the eyes, coughing, breathing difficulties (shortness of breath), lung problems, irritation of the respiratory tract, increased heart rate, palpitations, etc.”

Furthermore, the following was stated on page 21 of committee printed paper 17(20)28d: “Exposure to engine oils (including TCP) has repeatedly been linked to a series of short-term effects, which include irritation of the skin, eyes and respiratory tract as well as neurotoxicity [Boeing 2007], and with a large number of ‘dangerously toxic’ substances linked to exposure to pyrolysed oil [Stovel 1953]. The oils contain irritants, sensitising agents and neurotoxins [Michaelis 2010, chapter 4; Winder 2005]. In 1954, the USAF also noted degenerative symptoms in the brain, as well as irritation of the mucous membranes and lung damage (‘chemical pneumonitis’) [Treon 1954]. According to a study by the British Civil

Aviation Authority published in 2004, ‘the symptoms can range from irritation caused by the short-chain organic acids produced by pyrolysis of aircraft lubricants’ [CAA 2004]. This report also mentions base oil degradation products, which can cause ‘severe irritation of the eyes and throat and lead to eye and lung damage, even in low concentrations. [CAA 2004; Tomes 2001].

TCP is described as ‘toxic when inhaled, ingested or absorbed by the skin’, which ‘can lead to symptoms including the following: irritation of the skin and eyes, flaccid paralysis without numbness, changes to the motor skills, and muscle weakness. There may also be irritation of the respiratory tract and the mucous membranes, as well as severe damage to the nerves and digestive system, as well as muscle pain. Further symptoms include an upset stomach, distal complaints of the limbs, soreness, pain, numbness, headaches, dizziness, lack of appetite, paraesthesia, and loss of power in the limbs. It can also cause vomiting, diarrhoea and stomach pain... A tingling sensation in the hands and feet, as well as cramps, may also occur [NTP 1991].

It has been reported that inhaling PANs can lead to the following short-term symptoms: blue lips, skin or finger nails, confusion, convulsions, dizziness, headaches, nausea and unconsciousness. Repeated or extended contact can lead to skin sensitisation [ICSC 1998].”

Given these findings and the symptoms described, the BG Verkehr in particular should very promptly define the pathology. This should be diagnosed by the use of recognised medical blood testing methods, such as those used by the University of Nebraska-Lincoln, and recognised as an occupational disease that can affect flying staff.

