COLLEGIUM BASILEA

PRESS RELEASE

Subject: Inhalable Toxic Chemicals in Aircraft Cabin Air

The Workshop "Inhalable Toxic Chemicals in Aircraft Cabin Air" (ITCOBA), held on 11 October 2011 at Cranfield University, was organized in order to respond to the disinformation that has increasingly surrounded the issue of whether aircraft cabin air is contaminated with organophosphate neurotoxins, and whether those substances caused ill-health.

The issue has most recently been brought into focus by the publication earlier this year, by the UK Department of Transport, of the "Aircraft Cabin Air Sampling Study" reporting work carried out by the Institute of Environment and Health at Cranfield University. This report actually found significant concentrations of organophosphate neurotoxins and other noxious substances in cabin air even under normal flying conditions. Unfortunately, the final conclusion of the report is the statement: "With respect to the conditions of flight that were experienced during the study, there was no evidence for target pollutants occurring in the cabin at levels exceeding available health and safety standards and guidelines." The first phrase underlines the fact that the study failed to achieve measurement of a "fume event", even though that was one of its principal objectives. Even for "normal flying conditions" the purported conclusion is irrelevant because no standards are available for some of the most problematical substances. Nevertheless, despite the fact that this "conclusion" is neither sound nor justified by the actual work carried out, it has been carelessly and uncritically quoted, including by the UK Minister for Transport Theresa Villiers, and widely used to infer that there is no safety and health problem.

The ITCOBA workshop embraced a more comprehensive and integrated approach to the problem than has ever been attempted hitherto. All relevant academic disciplines were represented and the medical, economic and legal implications surrounding the issue were also tackled. It attracted a remarkably diverse group of participants, among whom were aircrew (both pilots and cabin staff), doctors specializing in aviation medicine, molecular biologists developing biomarkers for the medical conditions resulting from exposure, engineers

developing possible remedial technologies, journalists and lawyers.

It is generally recognized that, while not every possible experiment and observation has been carried out, there is already a great deal of data pertaining to the problem available. What is lacking is an adequate analysis of the data and a consequential plan of action.

The key starting hypothesis is "Certain substances present in aircraft cabin air cause neural degeneration". It was the aim of the Workshop to advance towards considered acceptance or rejection of this hypothesis and, along the way, to make it more precise. The primary focus should undoubtedly be on the tricresyl phosphates present in jet engine oil as antiwear additives.[1] Careful laboratory studies in animals have demonstrated their severe neurotoxicity. They can leak into the cabin via the oil seals in the engines and, as noted above, measurements have confirmed they do. There is, therefore, *prima facie* a health risk, increasing with the degree of exposure. Since practically the entire human body is innervated, functions such as thinking and motor control may be affected. *Prima facie* there must also be a safety risk since the pilots are breathing the same air, even before inhalation is sufficient to cause complete incapacitation.

Due to the wide range of symptoms[2] expected from a neurotoxin, especially those that cause physical degeneration of parts of the nervous system, and the delay (of the order of days after exposure of the order of hours) in their appearance after exposure, affected people may not consult a physician and even if they do their condition may be misdiagnosed. A particularly pernicious example is vague diagnosis as a psychiatric ailment which, if nothing else, prevents the correct treatment being applied. Highly encouragingly, successful biochemical treatments are being developed and are already available. A very important advance in biomedical science is the development of an assay for the main metabolic products of inhaled tricresyl phosphates. This will enable anyone thought to be suffering from exposure to be promptly and correctly diagnosed. It seems obvious that whenever aircrew have to be hospitalized after a flight all passengers should be medically checked. The existing evidence is that even the effects of low-level chronic exposure can be progressive and

[1] And, more generally, in gas turbines. Delegates at the Workshop also heard how very similar problems exist on offshore oil rigs, which make extensive use of such engines.
[2] For this reason, the term “aerotoxic syndrome”, which emerged in 1999, is a useful label.

debilitating.

Technical solutions. Given what would appear to be overwhelming evidence in favour of the hypothesis, the focus should move to possible technical remedies. One is to stop bleeding air. The Vickers VC10 from the early 1960s was, apparently, the last jet airliner to have a separate compressor until the Boeing 787, which today enters regular service for the very first time (with All Nippon Airways) and which resumes this earlier practice. But it will take many years before the world's stock of bleed air jetliners is replaced, hence other remedies must still be sought. One is to reformulate the oil to eliminate tricresyl phosphate. Steps are being taken in this direction but it is proving hard to find substitutes with the same mechanical properties. Yet another is to decontaminate the air before it reaches the cabin, using adsorbent material. Again, work is being carried out without, as yet, a wholly satisfactory system having been developed. This remedy will, in any case, only work in conjunction with technology to continuously monitor the air composition. The development of a retrofittable monitoring system should be given a high priority. It will alert pilots to any malfunction of the air supply leading to chemical contamination and enable a sound decision on what action to take in response to the reported level of contamination.

Finally, there are wider issues beyond the technical and medical ones on the aircraft. It appears that a significant (i.e., more than 10%) proportion of the population has a genetic susceptibility to organophosphate-induced pathology. Can they be identified and asked to take special precautions? Estimates of the numbers of sufferers -- bearing in mind that frequent flyers, who obviously have a greater chance of exposure, tend to be above-average contributors to gross domestic product -- suggest that, at national level, there is a strong *economic* case for prompt and effective remedial action. Retrofitting chemical metering on jet aircraft is probably the most immediately realizable solution. The mandatory inclusion of a health warning on air tickets, as on cigarette packets, would seem to be the alternative in the face of technical inaction.

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