Berrymans Lace Mawer LLP is a leading UK law firm, renowned for its dispute resolution and insurance expertise. It counts major airport operators among its transport sector clients.

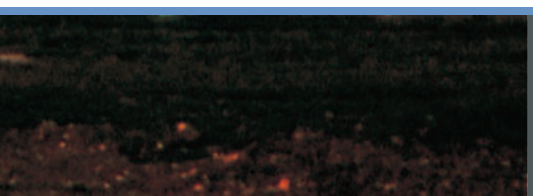
A number of toxic 'fume events' have given rise to concerns that modern airliners' air systems – which replenish the supply of air via the engines – are damaging to the health of frequent flyers and crew. In the last year in particular, reports of pilots retiring due to ill health have given credence to a controversial medical condition termed 'toxic air syndrome'. Nicola Williams, **a solicitor at Berrymans Lace Mawer LLP, addresses the possibility of future legal action brought by passenger and employees.**

Toxic air syndrome:
is there smoke without fire?

AN AIRCRAFT IS BEGINNING ITS DESCENT when the co-pilot suddenly becomes nauseous. He puts on his oxygen mask and looks to his captain, who already has his on. The captain says that he feels dizzy and groggy, and his movements are awkward and seemingly uncontrolled. These events sound like they could belong in an action film, but in fact occurred on a BAe 146-200 jet aircraft on 12 November 1999 whilst the aircraft was making its descent into Malmö airport, Sweden. The aircraft had suffered an oil leak in which more than 90 contaminants were identified as having aerosolised in the air supply. The crew were seriously incapacitated, but were able to recover, and the aircraft landed without any further incident, despite this "fume event".

The media reported another fume event on 18 February 2010, when a Boeing 757 bound from Barcelona to London was forced to make an unscheduled landing 20 minutes after take-off. The pilots had become aware of strong fumes in the cockpit and accordingly had made the decision to ground the flight. As with the Swedish flight, the aircraft landed safely and without further incident.

Notwithstanding the airline industry's proactive approach to safety, these fume events have given rise to increasing concerns about air systems in aircraft. Adding weight to the argument, a growing number of airline employees and passengers have come forward to say that they have suffered illness, ranging from minor conditions to serious neurological problems, simply as a result of breathing contaminated air on aircraft.



Of most concern are the compounds tricresyl phosphate (TCP) and phenyl-alpha-napthylamine. TCP is used in aviation fuel as an anti-wear / fire-retardant compound but is actually neurotoxic to humans, whilst phenyl-alpha-napthylamine causes skin sensitisation.

The cause

So how are jet-engine fumes getting into aircraft? Since the late 1950s, providing high-altitude aircraft with a continuous supply of pressurised air has been a challenge to engineers. Air from outside the aircraft is pumped into its air conditioning system, but given the temperature and pressure of air at high altitudes, it has to be heated and compressed first.

In earlier jet engines, on aircraft such as the DC-8 and Boeing 707, separate mechanical compressors were used to achieve this. However, it quickly became recognised that jet engines, as part of the propulsion process, heat and compress air whilst it is in the forward section of the engine, before the fuel is added and burned. This pre-heated and compressed air can therefore simply be "bled off" from the engine and pumped straight into the air cabin with negligible risks of contamination. As a result, bleed-air jets have been used in the majority of commercial airliners since the 1960s.

Obviously, bleeding air from the engine into the cabin is not risk free. Occasional seal failures can and do occur in the engines. When this happens, engine oil becomes vaporised in the bleed air and is pumped into the cabin. This results in a fume event.

Awareness of fume events is not new, and they have been recognised as far back as the late 1970s. What remains in dispute is the risks such fume events pose to the health of passengers and aircrew. To this end, many in the airline industry consider fume events to be rare occurrences, with contaminants at such low levels that they pose more of a nuisance than a safety issue. However, the evidence relating to fume events is far from clear.

There is much disparity in the data regarding the number of fume events that occur and, as a result, prevalence is greatly debated. The UK's Civil Aviation Authority (CAA) reports that approximately 500 fume events occurred on UK registered planes from 1985 to July 2006.

However, a survey by the British Airline Pilots Association (BALPA) in 2001 indicated that 96 per cent of fume events are never reported. The Global Cabin Air Quality Executive (GCAQE) agree, and state that fume events are significantly underestimated because the majority of them are seen as either "normal", or a nuisance and are consequently never reported. Australia, Norway and the USA have all officially acknowledged that fume events are significantly under-reported and all three consider this to be a major issue.

The UK Contaminated Air Database reports that 893 contaminated air events occurred on UK flights during the period of 1 January 2001 to 4 April 2006. As awareness of fume events grows, it is likely that the number of reports will continue to increase.

The effects

But what about the health risks; is there any evidence to suggest that fume events can cause health problems in passengers and aircrew? Are airlines leaving themselves open to personal injury/compensation claims?

Boeing's stated position is that "on the very rare occasions where bleed air contaminants may enter the cabin, the contaminant levels are expected to be lower than occupational thresholds established by toxicologists". The scientific community appears to agree. As recently as 2000, the UK House of Lords' Science and Technology Committee Report on 'Air Travel and Health' concluded that the evidence failed to show that there was a 'significant risk' to the health of airline passengers and crew from air contaminants.

However, as individuals continue to come forward saying that they have health problems as a result of breathing contaminated air on aircraft during fume events, pressure is mounting for an explanation. The term 'Aerotoxic Syndrome', coined in 1999 by campaigning groups to describe the symptoms, is beginning to gain credence. Some research is already suggesting that there are possible links between repeated exposure to toxic fumes on aircraft and the symptoms described by these individuals, most of whom are pilots.

The research of Dr Sarah MacKenzie Ross, a consultant clinical neuropsychologist at University College London, found evidence of 'cognitive impairment' in 27 pilots who had been referred to her. Of those individuals, 18 were classified by her as both impaired and ill. The research was independently reviewed by Professor Robin Morris of King's College Hospital, who concluded that the study could neither suggest, nor rule out a link.

However, it appears that the research was sufficient to influence the House of Lords' Science and Technology Committee, which changed its position significantly in 2007. In its updated report, the committee cited this research alongside the testimony of a number of pilots claiming ill health and the loss of their licences following fume events, and recommended that the chemicals in fume events be 'urgently' identified. They suggested it was then followed up by an epidemiological study on pilots, to ascertain the incidence and prevalence of ill health in aircrew that was associated with exposure to the identified chemicals. Cranfield University, headed by the late Professor Helen Muir, was charged with undertaking this research in a year long project, and was due to publish its findings in early 2010. At the time of writing, this report has yet to be published.

Currently, there remain genuine concerns as to the toxicity of jet fuel in fume events. Aviation fuels and oils typically contain toxic substances, such as organophosphates. Of most concern are the compounds tricresyl phosphate (TCP) and phenyl-alpha-napthylamine. TCP is used in aviation fuel as an anti-wear / fire-retardant compound but is actually neurotoxic to humans, whilst phenyl-alpha-napthylamine causes skin sensitisation.

The late Professor Muir, when speaking to the BBC on 24 September 2009, stated that whilst organophosphates will be found on flight decks, what matters is whether or not they are present in sufficient concentrations to potentially cause harm to people.

Certainly, a number of pilots and aircrew consider that they are, and say that their exposure to such fume events caused their health problems. John Hoyte, a former captain who piloted BAe 146 planes from 1989 until he stopped flying due to ill health in 2006, claims that his health progressively failed, leaving him 'a zombie like vegetable'. He claims that his memory deteriorated; he regularly suffered chronic fatigue; and his speech and thought processing abilities became so impaired he described it as feeling like he was permanently intoxicated. He claims that since ceasing to fly, his symptoms and health have dramatically improved.

Notwithstanding these types of claims, aerotoxic syndrome is yet to become a medically recognised term. In the event that scientific research establishes that there are health risks associated with fume events, it seems that this could change in future.

Industry impact

Obviously, any scientific link established between fume events and health risks is likely to have major implications for the airline industry. There are already three pending court cases in the USA, where both aircrew and passengers are suing Boeing for long-term ill health. Similar legal action is also being contemplated in the UK.

Regarding aircrew, as employees of the airlines they will be covered by the provisions of the Health & Safety at Work Act 1972 whilst the aircraft is grounded and Regulation 6 of the Civil Aviation (Working Time) Regulations whilst the aircraft is in the air.

In addition, the UK's Health & Safety Executive (HSE) has confirmed that the Control of Substances Hazardous to Health Regulations 2002 (COSHH) will apply to British aircraft and this will cover not just employee aircrew, but also passengers, who are covered by virtue of the fact that they are 'others who may be affected'.

There is no doubt that for the purposes of COSHH, bleed air contamination would constitute a 'substance hazardous to health'.

The HSE and the CAA have agreed under a memorandum of understanding, that the HSE will not intervene in health and safety matters on-board aircraft. In these circumstances it is for the CAA to both police and enforce breaches of health and safety legislation. However, the HSE does retain the right to enforce legislation whilst the aircraft is on the ground and therefore a breach of COSHH could potentially invite a criminal prosecution by the HSE for fume escapes that occur whilst the aircraft is grounded.

In the UK at least, there will be difficult hurdles for any civil actions. Litigation in respect of Gulf War Syndrome (which was claimed to have been caused by the use of chemical weapons) and for organophosphate poisoning (from use of "sheep dip") have all failed. This is largely due to the real difficulties in establishing a medically recognised condition and causation for the 'syndrome'.

Even without the results of these further studies and specifically that being undertaken by Cranfield University, the airline industry is likely to continue to be put under pressure to address these concerns. Boeing has recently launched the Boeing 787 'Dreamliner', which uses an electrical compression system and therefore does not use bleed air from the engines. It is yet to be seen whether or not other aircraft models will follow suit. What is clear is that there is a growing number of calls for airlines to take action, in the form of putting filters on bleed air feeds; by fitting toxic fume detectors; and by removal of organophosphates from jet engine oil.

This is going to have a huge impact on airlines in the coming years, as the modification and replacement costs are likely to be vast. It will probably be a number of years before existing airline fleets can be replaced or modified. Should a causal link be found between fume events and aerotoxic syndrome, airlines will have to take steps much more quickly to avoid potentially significant litigation costs.

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