Aircraft air quality

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Cosmic Radiation

IF YOU THINK YOU WERE EXPOSED TO ENGINE OIL OR HYDRAULIC FLUID FUMES ONBOARD, CLICK HERE FOR PRACTICAL ADVICE.

Smelled dirty socks onboard?

More reports of “dirty socks” fumes onboard: NBC news segment describes recently documented fume events that sent crewmembers to hospital and potentially compromised flight safety (Aug. 16, 2017)

Flight crew members say toxic air in plane cabin harmed their health: Good Morning America segment raises travelers’ awareness about the potential for exposure to oil fumes inflight (Nov. 22, 2016)

“Mystery illness” no so mysterious: Fume event reported on British Airways flight 286, Oct. 24, 2016. Captain told air traffic control that the diversion was necessary because of a “fume event” (listen to recording of exchange between ATC and captain, starting at 3:10) Flight scheduled from SFO-LHR; diverted to YVR. “Unusual smell” reported during cruise, some of the cabin crew felt unwell, emergency landing, all 25 members of crew treated upon landing. One passenger said it smelled as though someone took their shoes off. Another passenger said that medical attention had been recommended, but the airline would not cover the cost, quoted at $800 per person. In January 2017, a local news group reported that the investigation is ongoing after a leaked report described the effects on the crew.

Background information and practical advice:

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Because of way that aircraft (with the exception of the Boeing 787) are designed and operated, engine oil and hydraulic fluid fumes can contaminate the ventilation air supplied to the cabin and flight deck…(Read more…)

Many of the incidents reported to AFA-CWA are detectable upon boarding or taxi
out, but crewmembers are not trained to either recognize or respond to odors or fumes that may contain toxic engine oil or hydraulic fluid. Help to protect yourself by following these steps to better recognize and respond to onboard smoke/fumes.

Flight safety issues:


ICAO publishes Circular 344: The International Civil Aviation Organization published a circular that provides guidance on education and training for airline workers to recognize and respond to oil fumes onboard, given the potential for flight safety to be compromised when crews breathe oil fumes onboard. (Nov. 2015)

Summary of documents and investigative reports: Summary of a sample of published documents that describe potential for comprised flight safety caused by either confirmed or suspected crewmember exposure to engine oil-contaminated air onboard aircraft (rev. 2016). The earliest reference listed regarding exposure to “hot oil fumes” and the potential for flight safety to be compromised is an aviation medicine textbook published in 1939.

FAA recognizes pilot exposure to oil fumes as “unsafe condition”: Aviation regulator mandates inspections and “corrective actions” in the air supply system on one aircraft type to prevent crew exposure to engine oil fumes. The presence of oil fumes in the air supply system is not unique to this one aircraft type because all commercial aircraft (except for the B787) use unfiltered engine bleed air for ventilation, and all aviation engines are lubricated with chemically-similar oils.

Additional information:

Counterpoint to the most prevalent myths regarding exposure to oil fumes in the aircraft air supply system: Article published in the Journal of Biological Physics and Chemistry, 14: 122–132 (2014). You can access the abstracts of other articles in that issue, all addressing some aspect of onboard exposure to oil fumes, or access the full text of the entire fumes issue in pdf format.

German researchers publish findings that may help to explain the cognitive deficits reported by crews exposed to engine oil fumes: All aviation engine oils
contain a blend of tricresyl phosphates (TCPs) which help to maintain the thermal stability of oil and reduce wear on the engine. But when those oils contaminate the air supplied to the cabin/flight deck, crews and passengers are exposed to fumes that contain TCPs which are neurotoxic. One type of TCP is TOCP. TOCP exposure at high concentrations is known to cause paralysis, and aviation and oil industry representatives consistently claim that crews and passengers aren’t exposed to enough TOCP on aircraft to make them sick. German researchers have now identified signs of “functional neurotoxicity” in the brain cells of mice (in vitro) at very low TOCP concentrations, and propose that this mechanism may help to explain the cognitive difficulties reported by some crews and passengers exposed to oil fumes on aircraft.

**Airbus Chief Operating Officer dismisses concerns over exposure to oil-contaminated bleed air on its aircraft as “absurd”:** At the Farnborough International Air Show, Airbus Chief Executive Officer was asked if any of their aircraft will include non-bleed systems like the Boeing 787. The short answer is “no.” Watch the press conference clip [here](#). In contrast, Thomson Airways Communications Director acknowledges that the cabin air onboard the B787 is “much cleaner”: The B787 is the only commercial “bleed-free” aircraft flying today; specifically, it is uniquely equipped with an electrically-driven compressor, such that there should be no risk of the cabin and flight deck ventilation air being contaminated with toxic engine oil smoke and fumes. The B787 is also designed to provide a lower cabin altitude than other commercial aircraft of its size, which means a higher oxygen content in the cabin air during flight. (July 2014)

**Published review of fume events at one major US airline:** Review includes description of impact of exposure to smoke/fumes on crew health and flight safety.

**Sample of media clips and links to films:**

- [NBC story regarding lawsuit filed against Boeing](#) (2015). Also reported by the [Today Show](#) and [Chicago Tribune](#).

- [60 Minutes Australia: Story on oil-contaminated ventilation air on aircraft](#), including [extra interview footage](#) (Dec. 1, 2013)

- [CNN story on contaminated air event at one US airline](#) (2010).
Collection of additional media videos posted here.

Aviation Herald reports details of 2011 oil fume incident during flight from FRA to SFO: Article describes acute and chronic health impact documented by cabin crewmember (Dec. 4, 2013)

Investigative thriller A Dark Reflection: This Erin Brockovich-style investigative thriller is in production now. It tells the nail-biting story of a UK journalist who is trying to unravel what the airline industry knows about exposure to oil fumes inflight. You can watch the trailer, as well as some short video clips introduced by the Director.

Investigative news story (Dutch news: Zembla): Aired May 9, 2013, investigates reports of compromised flight safety/ill health reported by crews and largely denied by airlines.

International Transport Workers’ Federation educational film: The ITF is a global organization with 690 member unions representing over 4.5 million transport workers in 153 countries, including AFA-CWA. “Contaminated Air: What You Need to Know” was released on July 28, 2012 to help educate airline workers about the potential for exposure to oil fumes on aircraft, including practical steps to take if fumes exposure is either suspected or confirmed.

Videos that describe how aircraft engine “bleed air” can be contaminated with oil smoke/fumes - Part 1, Part 2, Part 3, Part 4: Educational tool created by Austin Byrd at the Tennessee Technology Center of Memphis (aviation maintenance school).


Additional stories/historical:

Oct 2011: Boeing suit settlement stirs jetliner air safety debate, Boeing concerned about contaminated air as early as 1953 – msnbc.com stories
Mar 2011: UK Department for Transport releases report into flight deck air quality measurements onboard 100 UK flights, conducted by researchers at Cranfield University (Part I, Part II). Report concludes no problem with aircraft air supply contamination. Read counterpoint here.

2008-09: King 5 News in Seattle ran an exclusive story in early 2009. In April 2008, the BBC highlighted the dangers of breathing contaminated aircraft air on its news program, "Panorama."

March 2009: ASHRAE President sent this letter to the heads of FAA and its European counterpart, EASA, urging the two agencies to investigate and determine the requirements for bleed air monitoring and solutions to prevent bleed air contamination with engine oil. This action was unanimously approved by members of the ASHRAE Aircraft Air Quality committee (SSPC-161P) in attendance at the Jan. 2009 meeting.

Sept 2008: Australian aviation regulator, CASA, has convened an independent Expert Panel on Aircraft Air Quality (EPAAQ). The EPAAQ has a broad mandate, covering both safety and occupational health and safety matters. The panel will review the evidence and prepare a report with recommendations. The report is expected to be delivered by the first quarter of 2010. The CASA website states that "Individuals and groups representing aircrew members have raised concerns about the possibility of low level chronic exposure to contaminants in aircraft cabin air leading to potential long term health effects. Some flight crew have reported a variety of symptoms that they have associated with cabin air quality. The evidence based relationship between cabin air exposures (either in normal operations or following incidents) and ill health in aircraft crews has been difficult to ascertain. The expert panel will: review existing literature on cabin air quality; seek submissions from interested parties who wish to provide evidence for consideration by the panel; and review the evidence and submissions and prepare a report with recommendations."

Dec. 2007: At long last, the ASHRAE Aircraft Air Quality Standard 161-2007 has been published. It is a voluntary standard, but represents the best consensus between industry and crewmember unions, and it includes provisions to prevent hot cabin conditions, limit exposure to oil fumes and pesticides, require gaspers in crew work areas, and more. Read about the highlights. Email AFA with any questions.

Jan 2007: Australian Transportation Safety Board releases report on pilot incapacitation, citing exposure to toxic fumes as the second-leading cause.

April 2007: UK Air Accidents Investigation Branch issues incident report regarding oil fumes in flight deck and a necessary diversion. Report recommends that EASA and the FAA require a flight deck detection and warning system for oil smoke/mist.

March 2006: Swiss Transportation Safety Board incident report concludes that exposure to oil fumes compromised ability of the copilot during approach and landing, that the captain had not donned his oxygen mask, and that the aircraft had a history of odors/fumes that had not been addressed.

Aug 2005: OSHA succumbs to pressure to settle case with ExxonMobil (see Aug 2004). Crewmembers and their doctors need to understand that the current "warnings" that ExxonMobil has published ignore the health risks associated with inhalation of engine oils and ignore the toxicity of meta and para isomers of the neurotoxic tricresylphosphates. Bottom line: if you are a hen, drink large volumes of engine oil, and are only worried about short-term effects to your peripheral nervous system, then the current warnings on the ExxonMobil labels and data sheets
Aug 2004: **OSHA cites engine oil manufacturer** Crewmembers and passengers can suffer neurological damage after exposure to aerosolized oil mists in the cabin and cockpit of commercial aircraft. In Feb 2004, AFA filed a complaint with OSHA, stating that ExxonMobil had, without basis, watered down the warnings about nervous system damage on the labels and Material Safety Data Sheets of its jet engine oils. ExxonMobil was relying on research that was incomplete and irrelevant to the exposure conditions and symptoms experienced by crewmembers and passengers.

June 2004: **FAA acknowledges that exposure to pyrolyzed engine oil can cause impairment** of the operational skills and abilities of the flightcrew, which could result in reduced controllability of the airplane.” Policy applies to BAe146 aircraft, but all commercial aircraft have bleed air system and all use chemically similar oils

2004: Aviation Organophosphate Information Site (AOPIS) releases documentary video on aircraft air supply contamination and the serious health effects it can cause among flight attendants, pilots, and passengers

July 2003: **AFA review of FAA response to 2002 National Research Council committee recommendations on aircraft air quality** In January 2002, the NRC Committee on Air Quality in Passenger Cabins of Commercial Aircraft released a report that detailed its year-long assessment of air quality on commercial aircraft, including ten recommendations. In response, the FAA acknowledged that it “has not kept pace with public expectation and concern about air quality and does not afford explicit protection from particulate matter and other chemical and biological hazards.” To date, though, the FAA has still failed to take any meaningful action.

June 2003: **Aircraft air quality: What's wrong with it and what needs to be done** AFA submission to the Aviation Subcommittee of The Transportation & Infrastructure Committee, US House of Representatives. Association of Flight Attendants, AFL-CIO. Also see passenger submission to Aviation Subcommittee hearing


Feb 2003: **Position paper of the International Task Group on Aircraft Air Quality** Labor group under the International Transport Workers' Federation concerned about aircraft air quality; members represent cabin crew in the US, Australia, Canada, Europe, Mexico, and South America.

Jan 2003: **FAA issues a recommendation (not a regulation) that aircraft passengers not be left without ventilation for more than 30 minutes.** We are unaware of action by the airlines to implement this recommendation as policy.
Nov 2002: Update on oil switch at Alaska Airlines and its relevance to crew and passenger health

Aug 2002: UK regulator issues recommendations to airlines in light of increased number of reports of pilot incapacitation. Oil leaking from the engines or APU into the air supply systems cited as "the most probable source" of the reports, and state that reducing occurrences of oil contamination will also reduce the risk of flight crew incapacitation.

Jan 2002: One page synopsis of NRC report on aircraft air quality. Association of Flight Attendants, AFL-CIO

Nov 2001: Swedish aviation authority (SHK) investigation into air quality incident onboard a commercial flight Nov 1999 during which the captain was incapacitated in flight when exposed to oil fumes. The first officer and the flight attendants also reported symptoms.

Jan 2001: AFA submission to the NRC Committee on Air Quality in Passenger Cabins of Commercial Aircraft


1956: Early recognition of oil fumes “problem”. US Air Force biochemist/researcher publishes a paper which recognizes “the problem” of exposure to oil fumes on commercial and military aircraft.

TCP references

Some FAA regulations and recommendations:

Search 14 CFR Parts 25 and 121 for the following current and historical regulations:

14 CFR 25.832 – Design standard for ozone
14 CFR 25.841 – Design standard for cabin altitude and depressurization limits
14 CFR 121.578 – Operating standard for ozone (not enforced with measurements)
14 CFR 121.219 – Operating standard that cabin be "suitably ventilated," plus an operating limit for carbon monoxide (not enforced with measurements)

Airworthiness Directive 2000-15-17 (required): Only applicable to certain aircraft, intended to prevent leaks in particular hydraulic fluid lines that can result in smoke and odors in the passenger cabin or cockpit (Effective Sept 12, 2000)
Advisory Circular 121-35: Recommend that passengers not be left without ventilation for more than 30 minutes (Jan 16, 2003)

Advisory Circular 121-36: Information on possible allergic reactions (peanuts, etc) in-flight (Dec 31, 2002)

Advisory Circular 120-38: Guidance for airlines to comply with ozone regulations (Oct 10, 1980)