Exposure to pyrolyzed oil on commercial aircraft: Crew health, flight safety, and engineering solutions

Proving and preventing exposure to oil fumes on commercial flights

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Airline crewmembers and passengers continue to report incidents of oil-related smoke, fumes, and odors in the flight deck and cabin, often confirmed by aircraft mechanical records. It is well-documented that oil fumes sometimes contaminate the aircraft air supply, although the frequency of these events has been a source of debate, as has the question of whether exposure levels are high enough to explain the wide range of reported neurological, respiratory, immunological, and psychiatric symptoms. It has been difficult to quantify exposures to fumes because airlines are not required to monitor the bleed air and have not allowed independent researchers to systematically collect air sampling and health survey data. Also, airlines are not obliged to share aircraft mechanical records, and the FAA has acknowledged that US airlines underreport events. As a result, symptoms reported by passengers and crewmembers often stay in the realm of "anecdotal," on the basis that either there is inadequate proof that oil contaminated the system, or that the concentration of oil fumes in the air supply could not have been high enough to be toxic. The vast majority of air sampling data for commercial aircraft have been collected under what are often called "non-upset conditions"; that is, during flights with no reports of air supply system contamination with engine oil, assuming that odor and visible smoke/fumes are reasonable surrogates of exposure. However, some data have been collected on "incident aircraft," confirming the potential for engine oil to contaminate the air supply and providing insight into the contaminants that aircraft occupants are being exposed to. More recently, a research team at the University of Washington has developed two "biomarkers" in the blood to enable crewmembers and passengers to objectively determine if they have been exposed to fumes. Additional inflight sampling data, biomarker data combined with medical and aircraft mechanical records, and animal experiments that measure inhalation toxicity on targeted areas of the brain will help to confirm the association between exposure to oil fumes and reports of acute and chronic ill health. Bleed air cleaning equipment, bleed air monitoring equipment, and less toxic aviation engine oils are being developed in an effort to mitigate both the risk and health impact of exposure to fumes.