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ASSEMBLY — 37TH SESSION

TECHNICAL COMMISSION

Agenda Item 46: Other issues to be considered by the Technical Commission

INVESTIGATION INTO FLIGHT SAFETY IMPACT OF IN-FLIGHT EXPOSURE TO OIL FUMES

(Presented by the International Transport Workers' Federation)

EXECUTIVE SUMMARY

This paper presents evidence that, globally, engine oil fumes sometimes contaminate the cabin and flight deck air supply system on commercial flights. In-flight exposure to oil fumes has repeatedly been shown to compromise flight safety when pilots experience acute symptoms that either slow their reaction time or impair their decision-making abilities.

Action: The Assembly is invited to adopt the resolution in the paragraph 2.1, based on the mounting evidence that in-flight exposure to oil fumes can compromise flight safety.

Strategic Objectives:	This working paper relates to Strategic Objective A.
References:	Doc 9902, *Assembly Resolutions in Force* (as of 28 September 2007)

[1] English, French & Spanish provided by the International Transport Workers' Federation

1. BACKGROUND

1.1 Commercial aircraft with a “bleed air” ventilation system entered operation in the early 1960s. The system design draws compressed cabin and flight deck ventilation supply air off the engines (“bleed air”), but the engines sometimes leak engine oil that can be heated to temperatures that exceed 650ºC and the supply air is not filtered before aircraft occupants breathe it. It is incorrect to assume that passengers and crewmembers are not at risk for inhaling pyrolyzed engine oil during some commercial flights.

1.2 When pyrolyzed engine oil contaminates the aircraft air supply system, crewmembers and passengers may notice a visible smoke, fume, haze, or mist coming from the air supply vents in the cabin or flight deck, or they may simply notice an unpleasant odor which is often characterized as “dirty socks” and not obviously engine oil. When this happens, crewmembers and passengers can inhale the oil.

1.3 The majority of aviation engine oils contain 2 to 6 per cent tricresylphosphate (TCP) anti-wear additives. Exposure to TCPs can damage both the central and peripheral nervous systems, resulting in chronic and sometimes irreversible neurological symptoms. A base stock ingredient in some engine oils can react with the TCP additives when heated in the engine to form an even more potent neurotoxin, trimethylolpropane phosphate (TMPP). TMPP exposure can cause seizures and the neurotoxic mechanism is thought to be irreversible.

1.4 In addition to the organophosphates described in 1.3, there is evidence that oil fumes may contain carbon monoxide gas, and have been shown to contain a complex mixture of aliphatic and aromatic hydrocarbons (some of which contain phosphorus), likely responsible for the respiratory symptoms so often reported by exposed aircraft occupants.

1.5 In the absence of a reliable reporting system or air quality monitoring requirements, it is difficult to estimate the frequency of smoke/fume events on commercial aircraft. There is evidence that both airline management and crewmembers underreport events, but there are still sufficient data to conclude that smoke/fume events are not rare.

1.6 There are few aviation regulations intended to prevent crewmember and passenger exposure to oil contaminated supply air, and those that do exist are not properly enforced.

1.7 The ITF has reviewed official reports of pilot and cabin crew impairment described as either likely or definitively caused by exposure to oil-contaminated ventilation supply air in-flight from Australia, Sweden, Switzerland, the United Kingdom and the United States.

1.8 The airborne concentrations of oil-based compounds during a fume event have not been well characterized, in part because airline management need not monitor either the cabin or flight deck air.

1.9 Pilots are not provided with any objective indication of either the nature or location of air supply contamination in-flight. Instead, pilots must rely on their noses and eyes to (a) determine when they are being exposed to oil fumes in-flight and (b) identify the location of the contamination in the air supply system in an effort to contain the airborne contaminants. During this process, pilots may be exposed to oil fumes which can impair their ability to troubleshoot the air supply system and prolong the exposure for cabin crew and passengers, creating an unsafe condition.

1.10 Maintenance workers have limited tools to identify the nature and location of bleed air contamination and are under pressure to limit aircraft ground time. Aircraft with reports of oil fumes are routinely dispatched because maintenance could not readily identify the fault. If the source is not remedied then crew and passengers on the next flight are exposed.

1.11 Limited research has been conducted to identify suitable means to filter the bleed air on commercial aircraft. Options include a combined HEPA/charcoal filter intended to trap particulate, gaseous, and liquid contaminants, a photocatalytic oxidation unit with a particulate filter upstream, and a rotary temperature swing adsorber with a particulate filter upstream. Research and development efforts have been limited because no aviation regulator yet requires bleed air cleaning.

1.12 Limited research has been conducted to identify suitable means to monitor airborne contaminants in the bleed air on commercial aircraft. Options include monitoring for a combination of volatile organic compounds that match a "fingerprint" for a particular maintenance product such as oil, hydraulic fluid, or exhaust fumes, or monitoring for carbon black (indicative of combustion), perhaps in combination with an organophosphate monitor that would distinguish engine oil from other sources. Research and development efforts have been limited because no aviation regulator yet requires bleed air monitoring.

1.13 Bleed air monitoring on each air supply source with flight deck indication, combined with bleed air filtration, would enable pilots and maintenance workers to more quickly and reliably identify, limit, and remedy exposure to oil-based contaminants.

1.14 A blood test for the presence of a metabolite of some TCP engine oil additives is under development in the US and is nearing completion.

1.15 In a progress report on resolution A35-12, intended to protect the health of passengers and crew, the Assembly reported that the Secretariat was monitoring cabin air quality activities being conducted in some member states (A36-WP/22). However, we are not aware of ICAO formally investigating the flight safety impact of in-flight exposure to oil fumes, despite the mounting evidence that flight safety can be compromised.

2. CONCLUSION

2.1 The Assembly is invited to adopt the following resolution:

Resolution 46/xx: Flight safety impact of exposure to oil fumes during commercial flights

Whereas toxic aviation engine oil fumes may contaminate the aircraft air supply system during commercial flights;

Whereas in-flight exposure to aviation engine oil fumes has been repeatedly reported to compromise flight safety when pilots experience acute symptoms that either slow their reaction time or impair their decision-making abilities;

Whereas airlines are not required to either filter or monitor the aircraft air supply system for aviation engine oil fumes;

The Assembly:

1. *Requests* that the Council direct the ICAO Secretariat to:

    a) issue a global call for documentation on any flight safety impact of exposure to aviation engine oil fumes on commercial flights to member states and interested parties;

    b) review the evidence;

    c) propose standards and recommended practices (SARPs), as necessary; and

2. *Requests* that the Council report on the implementation of this Resolution at the next ordinary session of the Assembly.

– END –