



INTERNATIONAL TASK GROUP ON AIRCRAFT AIR QUALITY
PREPARED BY THE INTERNATIONAL TRANSPORT WORKERS' FEDERATION

In recent years, airline crewmembers have become increasingly concerned about aircraft air quality. They report symptoms that range from general malaise to tunnel vision, fainting, and memory loss. The near-absence of effective regulations to govern the design, operation, and maintenance of air supply systems on aircraft, and the absence of a standardized air quality incident reporting system, have made it difficult to identify and correct aircraft air quality problems. As a result, many crewmembers are resigned to experience symptoms associated with the poor quality air in their workplace. This can compromise both operational safety and the health of crewmembers and passengers. Four general problems with aircraft air quality, each with a proposed solution, are described below.

1. Inadequate ventilation. Ventilation is a key component of good air quality. Maintaining a minimum flow of outside air into an indoor space ("ventilation rate") has been shown to control contaminant levels and limit reports of "sick building" symptoms such as headache, fatigue, nausea, and general malaise. On aircraft, the decision to increase ventilation conflicts with the commercial incentive to control fuel costs. As a result, the amount of outside air provided to each person on an aircraft is typically about half that provided in many other work environments, which contributes to substandard air quality. The assertion that recirculated air passed through a HEPA filter is equivalent to outside air is incorrect. The only effective solution is to increase the supply of outside air to a more acceptable level (e.g., 15 CFM/p of outside air). A recent analysis concluded that this would cost only \$0.12 (USD) per hour per passenger. If systems on the current fleet can not meet this standard, then they must be operated at their maximum flow rate. Additionally, the system's ductwork must be kept clean.

2. Reduced oxygen supply. The amount of available oxygen in the aircraft air during flight essentially depends on how high the aircraft is flying - flying at higher altitudes means less oxygen, all other things being equal. Aircraft must be designed to provide an effective altitude in the cabin ("cabin altitude") no higher than 8000 feet when the aircraft is flying at its maximum altitude. At 8000 feet, the supply of available oxygen is reduced by as much as 25% relative to what is available at sea level. There is no minimum *operating* standard for cabin altitude, but many aircraft are operated at or below their maximum certified flight altitude, such that cabin altitude should be equal to or less than 8000 feet. If, however, an aircraft is operated above its maximum certified flight altitude, then cabin altitude can exceed 8000 feet. On older aircraft, both external air leakage through door seals, and operating with cabin ventilation systems on low-flow as a fuel-savings measure, can cause cabin altitude to increase. The 8000 feet design standard was first introduced in 1957, based on studies of the oxygen needs of fit, young military pilots. The standard has not since been updated and there is a longstanding debate over whether the reduced oxygen supply associated with even the 8000 feet *design* standard is adequate for physically active cabin crew who require more oxygen than sedentary pilots and passengers. Additionally, if a person is medically compromised such as through heart or lung disease, is overweight, very old or very young, unfit, or taking certain medications, then their body will use the reduced amount of oxygen at altitude less efficiently than a fit pilot. Given the current demographics of an aging population, and the prevalence of obesity, smoking, asthma, and heart disease, the reduced oxygen supply at 8000 feet is clearly cause for concern. In this regard, we support the "precautionary principle" and consider a maximum 6000 feet operating standard to be more appropriate to meet the

oxygen needs of the general public and active cabin crew, in accordance with current research and medical opinion.

3. Contaminated air supply. As a result of deficiencies in system maintenance, operation, and design, the air supplied to the cabin and flight deck can be contaminated with various compounds, including hydraulic fluids and oils. When heated, these contaminants are a potential source of carbon monoxide, a gas that reduces the amount of oxygen delivered to the body's cells. This is especially serious at altitude where the supply of oxygen is *already* reduced. In addition, some commercial engine oils and hydraulic fluids contain a neurotoxic anti-wear agent that can contaminate the aircraft air supply. Over the years, cabin crew, pilots, and passengers around the world have infrequently but persistently reported symptoms consistent with exposure to carbon monoxide and neurotoxic agents. In more serious cases, contaminated flight deck air has been the prime suspect in some crashes and near-crashes. It is critical that affected crewmembers and passengers have access to specific airline maintenance records, and that regulators require airlines to continuously monitor carbon monoxide in-flight. The airlines must take responsibility for related illness and work with the manufacturers to keep the air supply systems clean.

4. Pesticide exposure. Some countries continue to require that incoming aircraft are sprayed with pesticides in order to kill insects that may be on board. This process is called "aircraft disinsection." The pesticides are applied in the occupied or soon-to-be occupied cabin. Crewmembers that fly to these countries are exposed to these pesticides on a regular basis. The degree of exposure can be considerable because every surface in the cabin and cockpit must be sprayed, but the aircraft is not always left to dry properly before crewmembers board. The World Health Organization approves these pesticide products as "safe," but the exposure potential and the health of the aircraft occupants have never been formally assessed. Crewmember unions have received hundreds of related reports of illness, including difficulty breathing and severe irritation of the eyes, skin, and throat. In some cases, immune system dysfunction and neurological problems have been reported. Mechanical alternatives to chemical treatment of aircraft are available and must be investigated, tested, and applied. Examples include curtains of treated mosquito netting over open service doors and a barrier of positively pressured air in the jetway to prevent insects from entering the airport.

Inadequate ventilation, reduced oxygen, the potential for contaminated supply air, and routine pesticide application without protective measures would not be acceptable in any other working environment or public space. This should not be acceptable in an aircraft either. Members of the ITF International Task Group on Aircraft Air Quality, along with all ITF affiliates, have resolved to advocate for legislation and regulations to ensure: (1) a minimum ventilation requirement that is consistent with that shown effective at controlling occupants' symptoms in ground-based environments (e.g., 15 CFM/p); (2) government funding for studies conducted by independent researchers to properly assess and document the oxygen needs of active cabin crew and a cross-section of typical passengers; (3) requisite and prompt access to relevant aircraft mechanical records following a documented air quality incident; (4) requisite continuous monitoring of carbon monoxide in the cabin and cockpit air supply systems on commercial aircraft; (5) standards to improve system design, operation, and maintenance in order to reduce the frequency and severity of air supply contamination; (6) research, testing, and promotion of mechanical means of disinsection; and (7) a standardized reporting system for all types of aircraft air quality incidents.