



SICK FROM POOR AIRCRAFT AIR QUALITY? HERE'S WHAT YOU NEED TO DO

- Call your LEC safety chair and report the date, flight #, aircraft #, your symptoms, and any details.** If you cannot reach your local safety chair or designated local official, you may also call AFA's Judith Murawski (206-932-6237 or cell 206-251-1203). AFA will provide you with information and support and will request the aircraft maintenance records on your behalf. These records may help to show whether engine oil or other chemical contaminants entered the cabin air supply.
- File an incident report with the company immediately and keep a copy for your records.**
- If you need medical attention, call your airline to get a workers' comp claim number so that your medical bills can be processed through workers' comp.** This is important because your regular medical insurance won't pay for work-related illness or injury and you don't want to get stuck with the bills.
- Get medical attention (as needed) to document your symptoms ASAP.**
 - AFA will fax/email information to your doctor/hospital/you on what you were likely exposed to and what medical tests may be helpful for your first visit. If you want more information for your doc or if you have questions about medical care, call AFA's Judith Murawski (206-932-6237 or cell 206-251-1203). Also see attached "What You Need To Tell Your Doctor" bulletin or visit <http://ashsd.afacwa.org> under "Health", "Air Quality."
 - Tell your doctor that you were likely exposed to heated aircraft engine oil or hydraulic fluid that contaminated the air supply system. Give the name of the product and the data sheet. If you don't know, ask AFA.
 - Tell your doctor that most engine oils and some hydraulic fluids contain toxic tricresylphosphates (TCPs) and that when the products are heated, carbon monoxide gas can also be supplied to the cabin.
- File a WC claim if necessary and keep a copy for your records.**
- Keep a record of your symptoms in a journal and go to the doctor as necessary so that everything is documented.** (You may develop new symptoms for weeks after your air quality event. If you are unsure what type of doctor you need to see, call Judith Murawski.)
- Take photos/video of any visible symptoms (rash, tremors, etc).**
- File a confidential report with NASA online at <http://asrs.arc.nasa.gov>**



**SICK FROM POOR AIRCRAFT AIR QUALITY?
REPORT IT – EVEN IF YOU THINK YOU'LL BE BETTER SOON
AND CALL AFA FOR HELP**

If you feel that you may be suffering from symptoms due to exposure to airborne chemicals that were supplied to the aircraft cabin via the air supply system, the best thing you can do for yourself is document it. **Don't just figure you'll likely feel better soon so there is no need to report anything. If your health problems persist or return after another incident, the paper trail will be critical. Start by calling your AFA LEC Safety & Health Chair or other designated LEC official.**

If the air supply system was contaminated with heated oil or hydraulic fluid, you might have noticed an **odorous smoke, mist, or haze in the cabin**. It might have smelled like burning oil or dirty socks. In some cases, crewmembers do not remember seeing or smelling anything unusual during a flight, although they report **symptoms consistent with exposure** to carbon monoxide gas or neurotoxic chemicals, and mechanical records confirm one or more failures that caused oil or hydraulic fluid to enter the air supply. Many symptoms that you may experience are not specific to contaminated bleed air. For example, you may have difficulty breathing due to insufficient oxygen or exposure to ozone.

If you have **symptoms that are visible, have somebody take photos or video** as soon as possible. Your doctor is unlikely to do this and it will help to establish the cause-effect relationship that you want to prove. Symptoms such as stomach cramping, fatigue, muscle pain, and confusion cannot be photographed, but must be documented by a doctor. Video may also help.

It is very important that you **see a doctor as soon as possible** to document your symptoms. Do not just go home. Get medical attention. It is *especially* important to have everything documented to protect yourself if your symptoms get worse. We have heard from flight attendants who have seen a doctor for bleed air-related complaints and been sent home with antibiotics. This is unacceptable! If you think that you were **exposed to heated oil or hydraulic fluids** on board the aircraft, you need to tell your doctor. Tell them when and what symptoms you had during the flight, what symptoms developed after the flight, and what symptoms you have now. Describe the conditions in the cabin. Give them a copy of the **information** on the AFA website (<http://ashsd.afacwa.org>, under "health"), especially AFA's "**What You Need To Tell Your Doctor**" bulletin. Call your AFA Safety Chair and/or the international office (contact information at the bottom of this flyer) for more information.

Whenever possible, **have your doctor perform objective tests** to document your condition. For example, if you have respiratory complaints, you might be able to have a lung function test to document any reduced breathing capacity. Nerve conduction velocity tests may be used to confirm nerve damage. If you are dizzy or faint, you may have been exposed to carbon monoxide and a blood oxygen hemoglobin test may be appropriate, although blood must be drawn within a few hours of exposure, and within one hour of exposure if you went on oxygen during the flight. Also, you don't have to be exposed to carbon monoxide to be exposed to toxic oils or hydraulic fluids.

File a report with the company promptly. Note the date, flight number and plane number. Describe the working conditions. Did you notice an odor or visible mist/haze/smoke? Were you aware of any mechanical problems? During what phase of flight did you develop symptoms? Was this the first time? Send a copy to AFA. AFA will request a copy of relevant aircraft mechanical records on your behalf. These records will help prove that the air supply system was contaminated.

Keep a copy of everything – every medical record, report, and photo. Keep a record of all phone conversations – names, dates, and a short summary of the conversation. If you have to mail anything, send it by certified mail with a return receipt. Reporting to the company is a priority, but to advocate on your behalf, **AFA also needs your information**. You can report at www.ashdi.com and at a minimum, please contact your LEC Safety Chair. **For additional information, contact Judith Murawski** at AFA's Air Safety, Health & Security Dept. Seattle field office (206-932-6237 or murawskiAFA@earthlink.net).



BAD AIR QUALITY ON BOARD AND GOT VERY SICK? WHAT YOU NEED TO KNOW AND WHAT YOU NEED TO TELL YOUR DOCTOR

If you believe that you **inhaled heated engine oil or hydraulic fluid** that entered the aircraft cabin via the aircraft air supply system during your flight, make sure you tell your doctor. Your assessment can be based on: (1) The conditions that you observed in the cabin during the flight (possible odor and/or visible fume/mist); (2) The symptoms that you developed during and after the flight; and (3) In some cases, what airline management or mechanics may have told you about the aircraft.

Your union will request a copy of the **aircraft mechanical records** that can provide a record of aircraft air supply contamination. These can be useful exposure records for your doctor, but it can take many months to obtain them.

It is important for your doctor to know that heated engine oil/hydraulic fluid can enter the aircraft air supply system, exposing you to a mist or fume that contains a complex and largely unknown mixture of chemicals. The mist or fume can **irritate and burn your eyes, nose, and throat**.

Different airlines use different engine oils and hydraulic fluids. For information on the specific product you were exposed to, **get the Material Safety Data Sheet (MSDS)** from your safety chair or Judith Murawski (see below) and **give it to your doctor**. However, make sure your doctor understands that the MSDS typically does not describe health hazards associated with inhaling these products (as they should, because that is how you are exposed to them on aircraft), only drinking them or getting them on your skin, so the health hazard warnings on the MSDS are generally underestimated and incomplete.

Tricresylphosphates (TCPs) are one of the toxic ingredients in engine oils and some hydraulic fluids. Exposure to TCPs has long been associated with initial symptoms of **stomach cramps, muscle weakness, flu-like symptoms, and delayed problems with gait, balance, and tingling/numbness**. More recent medical papers suggest that even very low levels of TCP can cause chronic symptoms of neurotoxicity such as **problems with fatigue, memory, concentration, and speech**. These symptoms can develop over days or weeks. A complete list of associated symptoms is attached to this bulletin.

Tell your doctor it is **not worth testing the level of red blood cell cholinesterase (also called "acetyl cholinesterase")** because it is a poor indicator of TCP exposure.

Ask your doctor to **test the level of plasma cholinesterase (PChe; also called "serum cholinesterase" or "butyl cholinesterase")** in your blood. TCP exposure can cause an initial depression in PChe followed by a "rebound effect." Multiple measurements over time and careful interpretation of the test results are necessary. Make sure your doctor knows that there are documented reasons why some people have depressed levels of PChe to begin with, putting them more at risk of toxic effects during an incident. For example, menstruation, pregnancy, specific medical conditions (like lymphoma) have been associated with reduced PChe.

Consider a blood test that will tell you if you have a genetic predisposition to elevated risk of toxic effects of exposure as a result of having the defective forms of PChe that are less effective at metabolizing toxins like TCPs. Insurance may not cover this test and even if you do not have the faulty form of PChe, TCPs can still make you very sick. However, a positive result would support your case if you have TCP-related

symptoms. The name of the test is dibucaine number (see www.labcorp.com), although it is not widely available.

You can also be exposed to **carbon monoxide (CO)** gas during these events because oil and hydraulic fluid in the air supply system get heated to high temperatures.

Make sure your doctor knows that it is unlikely that you will get your blood analyzed in time for this test to be useful. "Carboxyhemoglobin" levels in the blood will likely normalize within a few hours after an exposure and even faster if you went on oxygen during the flight (which AFA recommends). The effects of exposure to CO are more intense in-flight than on the ground because you are in a reduced oxygen environment. Even though CO clears from your body relatively quickly, it can still cause a variety of short or long-term symptoms such as dizziness, headaches, and fatigue caused by the exposure so it is important for your doctor to know about it.

Because there is no perfect blood test to prove either exposure yet, many crew and passengers have to rely on **medical tests that show damage** to your body. The doctor can then decide whether or not your test results are "consistent with exposure to a heated mist of engine oil or hydraulic fluid." For example:

If you have breathing problems, a doctor can examine your respiratory system and perform lung function tests.

If you have memory or concentration problems, a neuropsychologist can have you take specific tests, both to assess and document any problems and to suggest therapy.

If you have tremors, muscle twitches, or other movement disorders, a neurologist can assess and document the problems, possibly with some combination of a physical exam and a brain scan. **Autonomic nervous system testing may also be helpful.** Contact Judith Murawski for more information.

If you suffer from depression or anxiety after an event (whether due to brain damage from the chemicals or simply as a reaction to being ill), a psychiatrist can assess your symptoms and help you to manage them, possibly with some combination of therapy and medication.

As general advice, **keep a journal** of any symptoms you develop. For any visible symptoms (such as a rash or tremor), have someone take a **video or photograph**. See a doctor as soon as possible to make sure that there is an official record. Keep a copy of all documents and keep a record and short summary of every related phone call.

If you have more questions or need documentation to give to your doctor, please contact Judith Murawski at AFA's Air Safety, Health, & Security Department at 206-932-6237 or murawskiAFA@earthlink.net



SICK FROM POOR AIRCRAFT AIR QUALITY?
TELL THE PILOT
REPORT TO THE COMPANY
REPORT TO NASA
CALL AFA FOR HELP

It is critical that you tell the Captain if you think there is anything wrong with the aircraft air quality so that it gets recorded in the aircraft log book. Make sure you **tell the Captain what you observe/sense is wrong with the aircraft** (e.g., smoke, odor, something not right) and not just your symptoms. The Captain needs must have aircraft information to make a logbook entry. If the Captain does not write up the aircraft problem then maintenance need not investigate, the airline need not report to the FAA, the problem won't get fixed, and you have no hard evidence that there was a problem.

Telling the pilot is important but it is not enough. You also need to report to company in writing.

If necessary, fill out an injury/illness report (protocol varies according to airline) and ask for a workers' compensation claim number.

If you are willing, it is beneficial to **report these events to a confidential, online reporting system maintained by NASA** called the Aviation Safety Reporting System (ASRS). Go to <http://asrs.arc.nasa.gov> NASA will remove any identifying information (including your airline and the day of the incident) before adding your report to its online database, but it is important for NASA to know about these events because it means that the incident is now documented with an government agency and if everyone reported, there would be enough de-identified reports out there to push Congress to push the FAA for change.

PROTECT YOURSELF: if there is a problem with air quality, tell the Captain, file a report with the company to document the cabin conditions, ideally report to NASA, and call AFA for help.



AIRCRAFT AIR QUALITY: WHAT DOES THE FAA REQUIRE?

Here's a cheat sheet listing the **air quality Federal Aviation Regulations (FARs)** that manufacturers and airlines must meet:

1. Aircraft systems must be designed to ensure you get enough fresh air in the cabin to perform your duties without undue discomfort or fatigue, and that the air be free of harmful or hazardous concentrations of gases or vapors¹.
2. The pilot must enter any maintenance irregularity into the logbook².
3. The airline must report "each failure, malfunction, or defect concerning an aircraft component that causes accumulation or circulation of smoke, vapor, or toxic or noxious fumes in the crew compartment or passenger cabin during flight" to the FAA³.
4. Any maintenance work must restore the aircraft to its original (design) condition⁴.

Airlines are also required to ensure that levels of ozone gas and carbon monoxide gas are kept below certain levels, but without any air quality monitoring, there is no way to know if these standards are being violated.

If your airline has an ASAP program, don't forget that you can use it to report FAR violations, including air quality.

¹ 14 CFR 25.831(a) and (b)

² 14 CFR 121.563

³ 14 CFR 703(a)(5)

⁴ 14 CFR 43.13 (b) and (c)



ANSWERS TO FREQUENTLY ASKED QUESTIONS

IF I AM EXPOSED TO AIR THAT IS CONTAMINATED WITH ENGINE OIL OR HYDRAULIC FLUID ON THE AIRCRAFT, WILL I SEE OR SMELL A SMOKE OR MIST IN THE CABIN?

The short answer is "probably, but not necessarily." Many crewmembers that have reported air quality incidents to AFA and other unions describe an odorous smoke or mist in the cabin. They might see a fine smoke that smells like burning oil, for example. Or they might see a bluish haze that smells like dirty socks. In some cases, crewmembers do not remember seeing or smelling anything unusual during a flight, although they report symptoms consistent with exposure to carbon monoxide gas or neurotoxic chemicals, and mechanical records confirm that the air supply was contaminated.

WHAT CHEMICALS MIGHT I BE EXPOSED TO AND WHAT ARE THE SYMPTOMS?

You are exposed to a complex mixture of chemicals, although chemical analyses of these fumes have been published. (Contact AFA for references.) The health effects associated with exposure are not fully known and will vary between people. However, two chemicals of concern are:

a) Carbon monoxide

Carbon monoxide can be generated when oils and hydraulic fluids are heated to high temperatures. Carbon monoxide is a colorless and odorless gas. Although it is possible to be exposed without knowing it, it is unlikely because carbon monoxide is often accompanied by odorous fumes. Carbon monoxide robs your body of necessary oxygen. This is especially problematic during a flight because the supply of oxygen is already reduced, relative to what is in the air you breathe when on the ground. People who smoke already have some carbon monoxide in their blood and therefore have an even lower tolerance for environmental exposure. Also, increased temperature, humidity, and activity level can accelerate the toxic effects of carbon monoxide. The symptoms typically associated with exposure to carbon monoxide are listed in Table 1. This list may not be exhaustive. Also, there will be some individual differences in the way that people react.

Table 1. Symptoms typically associated with light, moderate, and heavy exposure to carbon monoxide.

| Light exposure | Moderate exposure | Heavy exposure |
|--|---|---|
| difficulty concentrating headache fatigue nausea shortness of breath visual changes | abdominal pain abnormal heart beat bluish lips and nails chest pain hyperactivity impaired judgment irritability/confusion pale skin reduced blood pressure vomiting weakness | balance problems bizarre behavior coma convulsions impaired speech and hearing muscle cramping muscle twitching retinal damage shock tremors |

In severe cases, carbon monoxide can cause long-term or even permanent brain damage, including personality changes, deficits in memory and other thought processes, and symptoms of Parkinson's Disease. CT and MRI scans may show changes in the brain.

b) Tricresylphosphates

Many oils and hydraulic fluids currently used in the airline industry contain chemicals called tricresylphosphates (TCPs). If the exposure is serious enough, TCPs can damage your brain and nerves. There are many different types of TCPs, and some are more toxic than others. We do not have complete information on the types and quantities of TCPs in the products used on aircraft. Some key symptoms associated with exposure to TCPs are listed in Table 2; all are serious, some more than others. It is important to know that some of these symptoms may not develop right away; instead, they may take weeks to develop.

Table 2. Symptoms typically associated with exposure to TCPs.

| Less serious | More serious | Most serious |
|---|---|--|
| eye irritation diarrhea gastrointestinal upset headache loss of appetite respiratory tract irritation skin irritation sore, aching muscles | disturbed sleep excitability/irritability gastrointestinal pain muscular pain, cramps muscle weakness (esp. arms, legs) respiratory tract burning restlessness vertigo vomiting | abnormal reflexes balance problems convulsions coordination problems delirium depression digestive system damage foot drop memory loss muscle twitching, spasms nerve damage paralysis (esp. arms, legs) stupor tingling, numbness vertigo wrist drop |

Sources of information include International Chemical Safety Cards (published jointly by the International Labor Organization and World Health Organization) and Medline Plus Medical Encyclopedia (published by the US National Library of Medicine and the National Institutes of Health). Also, see following references:

Abelson, A; Sanborn, M; Jessiman, B; and Weir, E. "Identifying and managing adverse environmental health effects: carbon monoxide poisoning" Canadian Medical Association J, 166(13) (25 June 2002).

Parkinson, RB; Hopkins, RO; Cleavinger, HB; et al. "White matter hyperintensities and neuropsychological outcome following carbon monoxide poisoning." Neurology, 58(1): 35-32 (May 2002).

US Congress Office of Technology Assessment "Neurotoxicity: Identifying and Controlling Poisons of the Nervous System. Chapter 3: Fundamentals of Neurotoxicology – Effects of toxic substances on the nervous system" NTIS order #PB90-252511 (April 1990).

United States Department of Defense "Aeromedical Training for Flight Personnel: Chapter 5: Toxic Hazards in Aviation" Field Manual No. 3-04.3.01, US Army Headquarters. Washington, DC (29 September 2000).