



Answers to frequently asked questions: Onboard exposure to smoke/fumes

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What are the possible sources of smoke and fumes in the cabin?

There are many sources of smoke, haze, fog, and odors (fumes) in the cabin and flight deck. In-cabin sources include galleys, people (perfume, smokers, etc.), uniforms, carpets, electronics, and carry-ons. Most cabin air quality issues may be smelly and unpleasant, but they typically do not make you sick. What many people don't realize is that the air supply system can also be a source of smoke/haze/fumes because it can sometimes get contaminated with engine oil, hydraulic fluid, engine exhaust, ground service vehicles, fuel, deicing fluid, and ozone. It is especially important for crewmembers to be able to recognize and respond to the presence of engine oil or hydraulic fluid smoke/fumes in the air supply system because of the toxicity of those compounds. Just like you get trained to act in an overwater landing, so too it is helpful to understand how oil can get into the supply air and what that can mean. If you do notice an unusual odor (fumes) onboard, especially if you experience unexplained symptoms, it is important to quickly try to identify the source; that is, are the fumes coming from the air supply system, or from either a person or item inside the cabin?

How can engine oil leak into my breathing air?

Unless you are hooked up to a ground cart, the air you breathe in the cabin is first compressed in the engines (inflight) or the APU (typically used on the ground). The APU is basically a small aircraft engine used for electrical power and air conditioning. The compressors in the engines and APU are lubricated with oil. The oil is supposed to stay on the "wet side" of each compressor, and not contact the "dry side" which comes into contact with the air that ventilates the cabin and flight deck. But if an oil seal leaks or a maintenance worker overfills an oil reservoir, for example, your breathing air can get contaminated. Knowing what phase of flight you were exposed to fumes, and whether or not fumes were also reported in the flight deck, can help to determine the location of the source.

How do people describe the smell of oil fumes?

Most commonly, oil fumes are described as smelling like dirty socks or having a musty/moldy quality. Other descriptions include: wet dog, electrical, foul, vomit, chemical, oily, noxious, old cheese, and pungent. AFA has received reports from multiple crewmembers on the same aircraft who all describe the smell differently because sense of smell varies between individuals. Also, be aware that if you are continuously exposed to fumes, you can develop olfactory fatigue, such that you won't notice the smell.

Isn't exposure to contaminated air only a problem if I can see smoke or haze?

No. AFA recently studied smoke/fume events at one airline over a two-year period. Only three of 87 events had any smoke/haze; the rest were "just" reports of cabin fumes (odor), but the reported health impact of exposure to "just fumes" is listed below:

Number of flights with 1+ crewmember who needed urgent medical care	27 of 87 flights
Number of flights with 1+ crewmember who lost work time	37 of 87 flights
Number of flights with 1+ crewmember who required follow up medical care	43 of 87 flights

“Just” oil/hydraulic fumes can still cause significant short- and long-term symptoms. See this AFA bulletin for some suggestions on ways to recognize and limit your exposure, when possible:

<http://ashsd.afacwa.org/docs/prevent.pdf> And again, keep in mind that only a minority of air quality events involve oil/hydraulic fluid, so be sure to first quickly check for the presence of any in-cabin sources of unusual odors.

I know that the air I breathe onboard is first processed in the aircraft engines or APU, but isn't it filtered before I breathe it?

No. It has been known within industry circles since at least the 1950s that oil from the aircraft engines/APU can contaminate the onboard ventilation air, and get supplied directly to the cabin and flight deck. It is also well-known that aviation engine oil fumes are very toxic. Still, the outside air you breathe onboard is not filtered before you breathe it.

When oil or hydraulic fluid fumes enter the cabin, can I be exposed to carbon monoxide?

Yes. Oil fumes, hydraulic fluid fumes, fuel fumes, and exhaust fumes can all contain carbon monoxide gas if they get heated to high enough temperatures in the engine/APU. The operating temperatures in those systems range from 250 to 950°F, depending on the phase of flight and air supply source. Carbon monoxide forms starting at temperatures around 450°F. The cabin air supply is not filtered for carbon monoxide before you breathe it. Immediate symptoms of carbon monoxide exposure include: headache, dizziness, fatigue, disorientation/mental confusion, giddiness, and fainting.

Is it true that some symptoms may be delayed after exposure to oil fumes?

Yes. Even some of the compounds that get into the air supply system, such as engine exhaust and fuel fumes, may make you feel sick temporarily, but you should recover quickly. Aviation engine oil fumes, on the other hand, contain some very toxic additives called tricresyl phosphates (TCPs) which, in addition to causing acute symptoms such as stomach cramping, weakness, and sinus congestion, can sometimes cause neurological symptoms which can be delayed and may not manifest days (or even weeks) after an exposure. Potential delayed-onset, chronic neurological symptoms include speech/memory deficits, abnormal gait/balance, fatigue, neuropathy (pins and needles), headache, and poor concentration. Some acute neurological symptoms like dizziness, headache, and disorientation may also manifest *during* a fume event, likely caused by exposure to carbon monoxide which can be a constituent of oil/hydraulic/fuel/exhaust fumes.

If I was exposed to fumes during my flight, how do I find out what I exposed to?

Make sure you have reported the incident to AFA and file a report with the company. The exact company paperwork and even the “chain of command” will vary somewhat by airline, but there is generally an airline injury/illness reporting form and workers’ compensation paperwork (if applicable) to complete. At AFA, contact your LEC safety representative first. Your LEC/MEC benefits representative and EAP representative may also be

good resources. And you can also contact AFA's Judith Anderson (206-932-6237, judith@AFSeattle.org), the staff member in the AFA-CWA Air Safety, Health & Security Department who works on chemical exposure issues.

Should I see a doctor?

For air quality issues that don't cause symptoms, seeing a doctor isn't necessary. But if you do have symptoms, see a doctor because you need to document the symptoms and seek relief. Typically, crews are first examined at either an emergency room or urgent care clinic. It is very helpful to bring the following two documents to any appointment:

1. [Two-page Health Care Providers' Guide](#) which was written by an occupational physician, funded by the FAA, and intended to educate other physicians on the health implications of aircraft air supply contamination; and
2. The safety data sheet (SDS) for the product that likely/definitely contaminated the air supply system.

AFA also recommends that you print and bring a copy of the "What Your Doctor Needs to Know" bulletin, available at <http://ashsd.afacwa.org/docs/docinfo.pdf>.

Under workers' comp rules, what doctor(s) can I see?

This will vary by airline. Most airlines require that, if you need emergency medical care, you go to a company clinic, or to an ER if there is no local company clinic or if the local clinic is closed. But again, this varies by airline, so check first! If you have questions about insurance issues/whether a doctor is covered, contact the AFA Benefits Committee member at your base. If you have questions about what type of doctor you should see for follow-up care, contact AFA's Judith Anderson (206-932-6237; judith@AFSeattle.org).

Can the doctors test my blood to identify/confirm what I was exposed to?

AFA is not qualified to give medical advice, but does provide information for you to discuss with your doctor. Regarding oil fumes, AFA is unaware of a specific blood test to definitively determine if you have been exposed. However, available blood tests that may be helpful include carboxyhemoglobin (blood marker of exposure to carbon monoxide), butyl/serum cholinesterase (blood enzyme influenced by TCPs), and serum c-reactive protein (blood marker of inflammation which can be increased after exposure to organophosphate chemicals such as TCPs). Scientists at the Univ. of Washington and Univ. of Nebraska have, independently, published papers on the preliminary stages of their work to develop blood tests specific to some of the TCP additives in aviation engine oils, but no test is yet finalized. The Univ. of Washington researchers have stored hundreds of archived blood samples, drawn largely from crews shortly after onboard exposure to oil fumes. Once the blood test development is finalized, the researchers will test those samples and communicate the results to each individual.

Paramedics met my flight and examined me. How can I get a copy of those records?

You have the right to a copy of your medical record from paramedics who may have met the aircraft. Typically, you can access those with a written request via the Emergency Medical Services branch of the relevant airport authority. AFA cannot request the paramedic records on your behalf because they are your private medical records. You can find the general phone number for the relevant airport authority online and ask to be

transferred to the fire/emergency medical services department. Alternatively, the necessary paperwork you need to file may be online. Try using the following online search terms: [name of city], airport authority, fire department, EMS, records. For example of necessary form to request a copy of Seatac airport paramedic records, click [HERE](#).

Firefighters met my flight with an air sampling device. How can I get a copy of their air testing data?

You have the right to any air quality testing data, if firefighters met the aircraft, for example. You can file a records request with the relevant airport authority to obtain that information. Again, the necessary form(s), or at least the general phone number for the relevant airport authority so that you can ask to be transferred to the appropriate department for a records request, should be posted online. As an example, the form for this type of request at Seatac airport is posted [HERE](#). Because air sampling data are not medical records, AFA should have the right to request a copy of air quality test data on your behalf, and can then share those data with you and the other members of the flight attendant crew.

When should I expect to feel better?

Recovery after exposure to oil/hydraulic fluid smoke/fumes is highly variable. It typically takes longer to recover from exposure to oil fumes than hydraulic fluid fumes, all other things being equal. Your recovery will be influenced by the degree of your exposure (concentration, duration), whether you have a history of exposure to such fumes, your liver function, genetic makeup, and other physiological factors, known and unknown. Everyone is different, but recovery from these types of chemical exposures can be slow.

What can I do to feel better?

AFA is not qualified to give medical advice. However, researchers, doctors, and affected crewmembers have shared their expertise, so AFA is passing this information to you because we recognize how little information is available. Again, this is not medical advice and some of it is still in experimental stages, so be sure to seek treatment from a qualified doctor!

- (1) It's important to stay well hydrated by drinking lots of water. There is also some evidence in the medical literature that a high-fiber diet may help with absorbing and excreting toxins from the digestive system.
- (2) "Olestra" and similar synthetic fats that pass through the gastrointestinal tract without being absorbed appear to "pull out" highly fat-soluble chemicals, enabling them to be excreted in the stool. Thus, ingesting olestra can speed the excretion of dioxin and some other fat soluble toxins (See: <http://www.ncbi.nlm.nih.gov/pubmed/15776770>; <http://www.ncbi.nlm.nih.gov/pubmed/10520643>; <http://healthnews.uc.edu/publications/findings/?/466/1576/>). The neurotoxic TCPs in aviation engine oils are fat-soluble, so there is reason to think that olestra may help to facilitate the elimination of TCPs (and chemically similar toxins) after an exposure to oil fumes. One study (<http://www.ncbi.nlm.nih.gov/pubmed/10481251>) estimates that ingesting 25 gram per day of olestra would more than double the overall rate of elimination of a particular dioxin compound from the body. To put this dose in context (assuming it translates to other fat soluble toxins), one serving of Pringles Fat-Free Pringles Super Stack contains 9 grams of Olestra, and one serving of Lays Original Light Potato Chips contains 11 grams of Olestra. So, a daily dose of 25 grams is equivalent to between two and three servings of these types of foods, per day. Such foods may be hard to find in the grocery aisle, but you can purchase

them online. Be aware that Olestra can cause diarrhea and cramping, and can dissolve fat-soluble vitamins (D, E, K, A) and carotenoids, so vitamin supplementation may be necessary. Ask your doctor if this may be a suitable option for you.

- (3) A small 2012 study (<http://www.ncbi.nlm.nih.gov/pubmed/22790946>) reported that taking three grams of chitosan (“kī-to-san”) for three consecutive days a week for four weeks increased the rate that the subjects excreted dioxin from their bodies. TCPs, like dioxin, are fat-soluble toxins. Chitosan is an over-the-counter supplement extracted from the shells of shrimp, lobster, and crabs, available at many health food stores and also online. It is a fibrous substance that might block absorption of dietary fat and cholesterol. People with shellfish allergies may be allergic to chitosan. Ask your doctor if this may be a suitable option for you.
- (4) There is preliminary evidence that drinking grapefruit juice immediately after an exposure to oil fumes may offer some protective effect from the subsequent neurological symptoms (<http://www.ncbi.nlm.nih.gov/pubmed/23085349>). It is known that the TCP neurotoxins in oil fumes must be “bioactivated” in your liver before they do damage to your nervous system. Some key liver enzymes that convert TCPs into the toxic metabolite are the same enzymes that metabolize the active ingredient in grapefruit juice. So, in theory, if you drink grapefruit juice, you may be able to “distract” your liver from bioactivating the TCPs in your system, or at least slow down the TCP bioactivation so that the production of the neurotoxic metabolite(s) is slowed, which may offer some protection from damage. This theory is grounded in science, but has not been formally tested and is only speculative, so is shared for informational purposes only. Be aware that if you take medications that are also metabolized by these p450 liver enzymes (whether to bioactive the medicine or excrete it), drinking grapefruit juice may interfere with the efficacy of such medications. Presumably, the bioactivation of TCPs is not delayed once it enters the bloodstream, although it is unknown how long the bioactivation process takes. So, presumably, grapefruit juice would need to be ingested without delay, although this has not been tested. Talk to your doctor about whether this is a suitable option for you.
- (5) The 2008 Health Care Provider’s Guide (<http://ashsd.afacwa.org/docs/HCPquick.pdf>) references patient reports that nebulized glutathione may be helpful. Glutathione is an antioxidant produced in your liver, but your stores can be depleted. You can take glutathione orally, but absorption through the gut is poor. An alternative option is to inhale glutathione mist generated by a nebulizer. The mist enters the bloodstream through your lungs, and bypasses the gut, so absorption is better. You require a doctor’s prescription that you fill at a compounding pharmacy. If you don’t have a nebulizer, you will need to purchase one. They cost approximately \$75 and may be covered by insurance. Ask your doctor if this may be a suitable option for you.
- (6) Some people have reported that a daily Epsom salt bath can be helpful. Fill the bath with water as hot as you can tolerate, add two cups of Epsom salts (cheap to buy from your local pharmacy). You can also add a box of baking soda. Soak for 30+ minutes.
- (7) Some people have reported daily saunas are helpful. IR saunas are an option, but are expensive. You may first want to try a sauna at your local YMCA or community center. Take a friend/family member, as a safety measure, in case you find the high temperatures unsuitable.

Final words of advice?

Get a notebook/dayplanner and keep a written record with the date of any symptoms (whether improved or worsened), medical appointments, and anybody you talk to by phone, whether from the company, doctor's office, workers' compensation carrier, or union. This is especially if your memory is impaired or if you are very tired. Ask a family member or friend to accompany you to medical appointments. Involve your significant other or a close friend in the management of your medical care. Keep a file with copies of all medical records, documents and correspondence related to your illness.

AFA is here to help.