



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

The outside air that gets supplied to the cabin and flight deck is “bled” off either the aircraft engines or an auxiliary engine called the APU. Because of design and maintenance issues, very hot oil or hydraulic fluid from the engines sometimes contaminates the ventilation air. The oil/fluid is pyrolyzed (decomposed by heat) and the fumes contain a complex mixture of chemicals. When this happens, you may notice an unpleasant odor or a visible smoke/fume. The chemicals can initially **irritate and burn your eyes, nose, and throat, and cause flu-like symptoms and stomach cramping** (see below). Read the bulletin posted at <http://ashsd.afacwa.org/docs/prevent.pdf> for advice on how to try to avoid exposure to fumes.

As of this writing, US Airways uses BP 2197 engine oil on its engines and APUs, and Skydrol 500B-4 hydraulic fluid. **Get the Material Safety Data Sheet (MSDS)** from AFA 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 (even though they should, because that is how you are exposed to oils and hydraulic fluids on aircraft), only drinking them or getting them on your skin, so the health hazard warnings on the MSDS are generally underestimated and incomplete. Also, bring a copy of a FAA-funded Health Care Providers’ Guide written by a doctor and intended to educate other doctors on this hazard. Available at: <http://www.ohrca.org/pdf/quickreference.pdf>

**Tricresylphosphates (TCPs)** are one of the toxic ingredients in BP2197 oil. The Skydrol product contains tributylphosphates (TBPs) which are less toxic, but still a problem. 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, and there may be a delay between exposure and symptoms.

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 initially cause a depression in PChe level, followed by a "rebound effect" a week or more after the event. Multiple measurements over time and careful interpretation of the test results are necessary. Your doctor also needs to know 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](http://www.labcorp.com)), although it is not widely available.

There is some evidence that exposure to organophosphate chemicals (like the TCP additives in engine oil) can cause your level of **serum "C-reactive protein"** to increase. It is a blood marker of inflammation; see <http://www.ncbi.nlm.nih.gov/pubmed/17389175>. Ask your doctor if this is a suitable test for you.

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

Be aware 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 incident 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 blood test to definitively determine if you have been exposed to oil fumes, a **research team at the University of Washington** is developing a test. More details on how you can participate in this research project at <http://ashsd.afacwa.org/docs/howto.htm>.

In the meantime, crew and passengers have to rely largely 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 or tics, a neurologist can assess and document the problems, probably with some combination of a physical exam and a brain scan. A SPECT scan may be suitable to assess damage caused by exposure to organophosphates. You can contact AFA for research papers to share with your doctor.

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 [Judith@AFASeattle.org](mailto:Judith@AFASeattle.org).**