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Documents show firm long concerned about health risks of rare fume events

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msnbc.com

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SEATTLE — A former flight attendant is believed to be the first person in the U.S. to settle a lawsuit against the Boeing Co. over what she claims is faulty aircraft design that allowed toxic fumes to reach the cabin, triggering tremors, memory loss and severe headaches.

The amount and other details of the settlement Wednesday between former American Airlines worker Terry Williams, a 42-year-old mother of two, and Boeing were not made public as a condition of the agreement.

But 250,000 pages of company documents turned over to the plaintiff's legal team by Boeing seem certain to fuel the long-running battle over the safety of cabin air in commercial jetliners.

"The issue is really heating up now," Judith Murawski, a Seattle-area based industrial hygienist for the Association of Flight Attendants-CWA, told msnbc.com, adding that she typically handles at least three new cases a week involving crew members exposed to fumes. Many calls come from crew members on their way to emergency rooms or urgent care clinics, she said.

On at least one U.S.-registered commercial jetliner a day — out of approximately 28,000 flights — pilots, flight attendants and passengers are exposed to toxic smoke or fumes entering the plane's air conditioning system, say industry officials. And the documented incidents of contaminated air, which can contain tricresyl phosphates (TCPs), carbon monoxide and other toxic components, may not cover all the exposures.

Boeing and the airline industry have long maintained that cabin air — compressed air pumped, or "bled," from the plane's engine — is safe, saying such breaches are extremely rare and that short-term exposure to the tiny amounts of toxic substances in the cabin air poses no health risk.

Boeing, acknowledging the settlement with Williams, said it "still contends that cabin air is safe to breathe and studies by independent researchers have consistently shown that existing systems for providing cabin air to passengers and crew meet applicable health and safety standards."

But stricken airline crews and their advocates say faulty "bleed-air" systems have been causing health problems dating back to the takeoff of jet travel in the 1950s. In severe cases, they say, exposure to the toxic fumes has cost afflicted pilots their jobs when they lost medical clearances and kept flight attendants from working. Moreover, passengers are not informed what they may have breathed and can be endangered if pilots experience aerotoxicity symptoms such as drowsiness, disorientation and memory loss as a result of exposure, the advocates say.

"Flying on aircraft is very safe — mechanically obviously," said Dr. Robert Harrison, lead author of the Federal Aviation Administration-sponsored [guide for health care providers](#) treating airline workers exposed to bleed-air contaminants.

"Cabin air is safe to breathe; crew and passengers can feel safe and comfortable on commercial aircraft. Rarely ... mechanical problems can occur with ventilation that can lead to exposure to airborne chemicals. Most will have temporary symptoms, but be aware of a small possible chance of chronic health issues," said the San Francisco-based physician, who has diagnosed such exposure in more than 40 patients over 15 years.

A recent 105-minute documentary, "Angel Without Wings," is focusing additional attention on the issue. The film depicts former Australian pilot Susan Michaelis' 13-year effort to expose what she calls the aviation world's biggest cover-up — a workplace health issue that ended her career on July 23, 1997, at the age of 35.

"That's the day I collapsed after a flight," she told msnbc.com.



Terry Williams, left, a former American Airlines flight attendant, listens to her attorney, Alisa Brodkowitz, in Seattle. Toxic fumes into an airplane's cabin, leaving her unable to work.

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Boeing settlement

Terry Williams says her life was changed by a single exposure, when toxic smoke and oil fumes leaked into her MD-82 aircraft cabin on April 11, 2007, as American Airlines Flight 843 from Memphis, Tenn., to Dallas taxied to the gate.

Her eyes began to water, her throat tightened, she began to cough and she developed a headache that hasn't gone away. She said she also was left with memory loss, recurrent tremors, disabling coughing spasms, asthma, sore throat, fatigue, nausea, speech impairment, loss of balance, vision impairment, and numbness and tingling in her hands, arms, shoulders and feet. She said she misses the days when family and friends called her a dynamo before her injuries.

"When I used to make French toast for my family, first I'd make the bread," said Williams, who enjoyed cooking for her husband, Gary, and their sons, Zak, 7, and Jake, 5. "Now I can't even remember the recipe."

Workers compensation doctors in San Francisco diagnosed her with neurotoxic disorder due to exposure to the fumes.

Williams sued McDonnell Douglas and its parent company, Boeing, in King County, Wash., Superior Court in 2009. [The suit claimed](#) the airplane maker knew the plane and its bleed-air system were defective and did nothing to protect Williams or other passengers and crew members.

[In a deposition](#) filed by Williams' attorneys, US Airways captain Mick Fowler said he suffered "fatigue and wooziness and grogginess" during a fume event while landing a Boeing 767 filled with passengers in Charlotte, N.C., on Jan. 16, 2010. Although he landed the plane safely, "it's not an experience that I would like to repeat at all," he said.

Fowler was taken off the plane on a stretcher and whisked to an emergency room after landing, said Alisa Brodkowitz, a Seattle-based aviation attorney who was Williams' lead co-counsel.

As the case developed, Boeing turned over 250,000 pages of documents dating to 1954 and [1955](#) that showed the company was aware of cabin air contamination and had sought detection and filtration systems to combat the problem. Others documented concern among executives that [there could be health hazards](#) related to exposure to toxic fumes when oil leaks into bleed-air systems.

"It's bizarre that we're talking about the 1950s, but that's where our air data comes from with respect to the MD-80," Brodkowitz said. "To this day, the only thing filtering this toxic soup out of the cabin are the lungs of the passengers and crew."

Boeing, like jetliner manufacturers Airbus and British Aerospace, has relied on bleed-air systems since it began building commercial jetliners in the early 1950s. However, its new 787 Dreamliner instead has an air circulation system that uses electric compressors.

Boeing spokesman Bret Jensen told msnbc.com that the decision to design a new system was based on fuel savings and environmental performance.

"It had nothing to do with bleed air," he said.

However, in [a document](#) Boeing sent to the FAA while seeking approval of the 787 design, the company cited concerns about carbon monoxide, which is released as TCP breaks down.

"In an airplane that bleeds air from the engine compressors, it is possible to liberate engine lubricating oil into the bleed air system from the failure of engine oil seal and then potentially CO (carbon monoxide)," the document said. "The 787 aircraft does not have a traditional bleed air system. It provides outside supply air from electric compressors with air bearings and is not subject to an engine oil seal failure potentially contaminating the air supply."

In addition to arguing that cabin air is safe, Boeing also asserted that it met federal standards when its airplanes were certified by the FAA and therefore could not be held liable for Williams' injuries, said Leslie Brueckner, an attorney with the Oakland, Calif.-based public-interest law firm Public Justice, which also participated in Williams' case.

"The court denied that motion," Brueckner said.

Michael Withey, another co-counsel, said he hopes the airline industry will be persuaded to at least provide detectors on airplanes.



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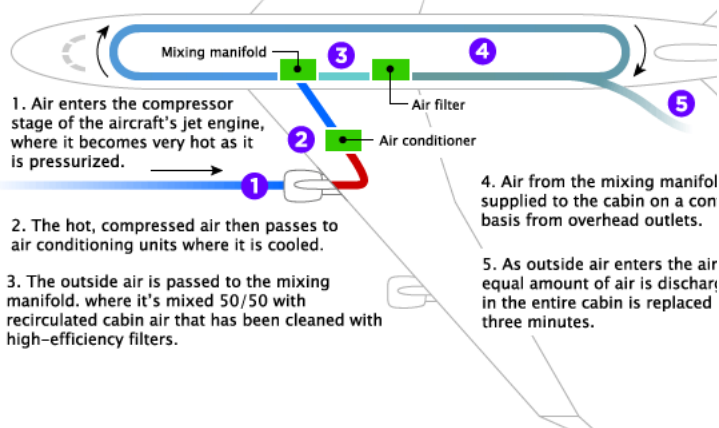
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Cabin air

The cabin air system in today's jetliners is designed to provide a safe, comfortable cabin environment at cruising altitudes that can reach upward of 40,000 feet.

Briefly, here's how the system works:



SOURCE: Boeing, Airbus, flightglobal.com

"If you have a detector in an air duct, it could send a signal to a computer or pilot who could turn off the airflow and stop contamination from entering the cabin," he said.

Kelly Skyles, national safety and security coordinator for the Association of Professional Flight Attendants, which represents 18,000 American Airlines flight attendants, said her organization, which was not involved in the lawsuit, also hopes Williams' case contributes to passenger and crew safety.

"Crews are locked up with passengers in a working environment," she said. "Anything we're at risk of, they're at risk of."

AFA and APFA are pushing Congress to allow the Occupational Safety and Health Administration to work with the FAA on regulating aircraft cabins as working environments.

American Airlines, Skyles said, has "stepped up the game" in investigating strange odors and smoke fumes and holds monthly meetings to address incidents.

'Emotional issue'

But other airlines have drawn criticism for their response to crew members' complaints.

Sixteen US Airways pilots and flight attendants in April [sued](#) a US Airways contractor, ST Aerospace Mobile, over what they said was improper maintenance at its Mobile, Ala., servicing center that resulted in six fume events aboard the same Boeing 767 from Dec. 28, 2009, to April 25, 2010. Among the plaintiffs' symptoms were headaches, sore throats, eye irritations, dizziness and nausea. Some also complained of fatigue and cognitive difficulties.

At least two plaintiffs were pilots who lost their medical clearances, attorney Robert Spohrer of Jacksonville, Fla., told the Mobile Press-Register newspaper.

In August, the union representing 6,900 US Airways flight attendants sent a [letter](#) to FAA Administrator Randy Babbitt seeking an investigation of 87 purported air supply contamination events in 2009 and 2010, 41 of which were confirmed with mechanical records as oil-contamination events.

"US Airways, like every other U.S. airline, does not install and operate either bleed air monitors or filters and does not provide appropriate training/education to crewmembers to help them recognize (and, thus mitigate the impact of) exposure to fumes on aircraft," said the Association of Flight Attendants letter, signed by union President Veda Shook, who also charged underreporting of incidents by airlines to the FAA.

"This is an emotional issue for flight attendants," said US Airways spokesman John McDonald, adding that the letter inadvertently demonstrated that the risk associated with fume incidents is being exaggerated.

In the two-year span cited in the letter, US Airways had 2.2 million flights, McDonald said. Of the 87 incidents the union listed, only 40 eventually turned out to be fume events, he said.

Paul Morell, US Airways' vice president for safety, said the airline tracks and works to prevent fume events. However, he said, reports of odors don't always mean oil fumes. Some odors turn out to be galley smells or other odors, such as electrical malfunctions.

"The magnitude of the problem is not as large as some have portrayed it," he said.

Each incident is reviewed at weekly task force meetings, which led to at least one change in maintenance procedures to prevent mechanics from overfilling oil levels in auxiliary power units, Morell said.

Rick Pleus, a Seattle-based toxicologist who consults for US Airways, said that even when oil fumes leak into cabins, exposure to TCP is at such a low dose and for so short a time that reported symptoms of tremors and other effects don't match up with data about health risks.

"There is no literature that supports that," Pleus said. A person would have to drink 2,000 milligrams a day, five days a week for 10 weeks, to ingest enough TCP to cause organophosphate-induced delayed neuropathy (OPIDN), which affects extremities like feet and hands, not the central nervous system, he said.

A 1994 Mobil Jet Oil II [Material Safety Data Bulletin](#) lists ingredients including TCP. It says the oil "under normal conditions of use and with appropriate personal hygiene practices" is not expected to produce neurotoxic effects.

"Over exposure to TCP by swallowing, prolonged or repeated breathing of oil mist, or prolonged or repeated skin contact may produce nervous system disorders including gastrointestinal disturbances, numbness, muscular cramps, weakness and paralysis," the bulletin says.

But researchers say that TCPs — which are used in many products, including solvents, waterproofers and lubricants — become even more toxic when "pyrolyzed," a chemical change brought about when jet engine oil reaches temperatures up to 800 degrees.

Murawski, the industrial hygienist for the flight attendants union, said exposure also affects different people different ways.

"Not everyone's going to get sick," she said. Enzymes, genes, medication, diet, pregnancy and other factors "influence how a person will react to chemicals."

Harrison, the physician who developed the FAA's treatment guide, said that with "dozens of airlines, all sorts of different aircraft and airports located around the world, there's no system to keep track of how many pilots and flight attendants get sick or how many are permanently ill from exposures."

"Most crew get better pretty quickly, but some pilots and flight attendants go on to have health problems that can last for months or even longer," he said.

He described four main problem areas he sees in patients exposed to fumes: respiratory, neurological, systemic, and psychiatric, including stress.

"It is often an emotional problem when somebody gets sick," Harrison said.

Nancy Young, vice president of environmental affairs for the Air Transport Association, said the safety and health of passengers and crew are the airline industry trade group's top priorities.

She said ongoing studies bear out that bleed-air contamination is rare.

ATA, as well as ExxonMobil and other airline trade groups, cited United Kingdom Department of Transport [research by Cranfield University](#), which found after monitoring 100 flights that no fume events occurred and that no pollutants such as TCP were found in cabin air at levels exceeding health and safety guidelines.

Young also said the FAA has established an Airline Cabin Environment Research ([ACER](#)) center to conduct peer-review studies.

While Williams' lawsuit is believed to be the first of its type settled in the U.S., an Australian court has held aircraft manufacturer British Aerospace liable for the injuries of Joanne Turner, a flight attendant for now-defunct East-West Airlines.

Turner was five months pregnant in 1992 when she breathed thick smoke entering the cabin of a British-built BAe 146 on a Sydney-to-Brisbane flight. Following the exposure, she suffered a burning throat, sore eyes, a headache and a persistent cough. She sued East-West in 2001. In September 2010, the Australia High Court upheld her \$138,757 (Australian) award. A lower court found that it could have been foreseen that the breakdown of seals on the plane's auxiliary power unit would allow toxic oil fumes to enter the cabin.

British Aerospace in 1993 paid East-West and Ansett airlines more than \$2 million to settle complaints about the BAe146, according to the Sydney Morning Herald.

Research ongoing

At the University of Washington, Professor Clem Furlong and about 10 researchers tucked in a basement medical and genomics lab have been working about seven years to develop a blood test to prove with a biomarker that someone aboard an aircraft during a fume event was exposed to TCPs.

The researchers are cloning human proteins, separating components of blood, characterizing gene structures, running tests with mass spectrometers and publishing [papers](#) detailing their [progress](#).

The lab gets several blood samples a week from people who say they have been exposed. Those samples are stored at minus-80 degrees as workers come up with ways to test them.

"The long-range goal is to identify with mass spectrometer modification of protein to see individuals exposed to jet engine oil," Furlong said. Their work may also help oil manufacturers develop less-toxic lubricants, he said.

Pleus, the toxicologist working with US Airways, said a biomarker could be a useful tool in understanding exposure, but it won't identify the source of exposure to TCP and its component or how much a person was exposed to.

"The fact that you can detect something doesn't mean it is toxic," he said. "You have to have dose."

Taking the issue to the public

Susan Michaelis, who dreamed of flying while growing up in Melbourne, Australia, and later realized that goal by becoming a commercial pilot, traces her health problems to 1994, when she began flying the BAe 146 in eastern Australia.

"I would turn the air on and there would be a dirty-sock smell," Michaelis said.

She started getting headaches, nausea and fatigue. At first, the symptoms would pass, but they grew more persistent, finally leading to her collapse.



Chris W

Professor Clement Furlong, at his University of Washington and genomics lab in Seattle, is heading a project to develop a test to prove exposure to pyrolyzed TCP.

Michaelis has since become a leading crusader for [cabin air safety](#), publishing a 931-page doctoral thesis on the topic in 2010 and in her documentary, "Angel Without Wings," recounting her story and those of others in the airline industry who lost their jobs. The film's name comes from an award she was given by [Global Cabin Air Quality Executive](#) (GCAQE), a coalition of health and safety advocates.

"It was like piecing together a jigsaw puzzle," said Michaelis, who lost her pilot's certification after her collapse. She said the research and the film were delayed because she has trouble breathing, suffers from central nervous system ailments and has a hard time multi-tasking.

The documentary "pretty much glued it all together" from global research and interviews with pilots, flight attendants and passengers suffering from what some people call aerotoxic syndrome, she said.

"Heated oil spills so regularly it's seen as normal" on flights, she said. Incidents often go unreported, she said, because crews don't understand the problem. That ensures the passengers will never be told, she added.

"The documentary is an alternative way to tell the public about the problem," Michaelis said. "This is at the level of the big tobacco cover-up."

Seeking solutions

Michaelis and Murawski expressed optimism that exposure of the issue will create more pressure for solutions.

Chief among them are detection systems, filters, less-toxic oil and better regulation and enforcement by the FAA, Murawski said.

"The nose won't always know," Murawski said. "I know of pilots who lost their licenses to fly due to health problems caused by oil fumes, and they didn't even smell anything. Many other crew members start to feel sick and smell 'dirty socks' or a musty, unusual odor but are not trained to consider that it may be oil fumes in the air supply," she said.

"We don't want to breathe the bleed air; we want the air filtered," Michaelis said. "If enough people asked, filter manufacturers could stop this from coming in."

Harrison, who noted that he is a prevention specialist as well as a treatment specialist, said he would much prefer a solution that would ensure nobody suffers health problems because of exposure from fumes in cabin air.

"Great engineering minds need to be applied," he said.

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