He took a short cut

Did it cost him his life?

Pilot Brian Toso was killed in a helicopter crash in Canada on 20 October 1997. Just a few weeks before the accident he wrote this story for a Canadian safety journal.

Brian Toso

ROB FOX

WHILE I WAS GETTING ready for a routine flight in a Bell JetRanger, a customer called to tell me that he had shortened the trip and wanted to add more people. In order to be within legal weight limits for take-off, some fuel had to be removed from the aircraft.

I didn't have the proper hose and fittings for the electric pump, so I decided to use a rubber hose and siphon the fuel into a barrel. I exhaled and took a fairly hefty suck on the hose and, sure enough, the Jet B started flowing.

However, I inadvertently inhaled a considerable amount. I spat out the awful-tasting liquid and rinsed my mouth with coffee, stuck in some chewing gum and went flying.

As it turned out, the customer changed his mind again, so I had to go to the nearest airport for more fuel. I asked the customer again about how much flying was involved. He said enough to do the originally planned trip — so I added adequate fuel. Returning to pick up the other passengers, we carried on. We had just gotten airborne when they decided that they were hungry and wanted to return to Grande Prairie, Alberta.

> **"I had severe headache and nausea and it felt as if all my joints had hot wet sand in them. My chest pains got worse to the point where breathing became difficult."**

About five hours had passed since I ingested the jet fuel and the only effects so far were horrible burps, which brought up that horrible taste again. However, my right wrist and shoulder were starting to ache and I had mild chest pains. Despite this, the flight went well.

After deplaning and paperwork, my left shoulder started aching and I started feeling nauseous with flu-like conditions. I decided to go home and lie down. Conditions got worse. I had severe headache and nausea and it felt as if all my joints had hot wet sand in them. My chest pains got worse to the point where breathing became difficult.

I phoned my doctor and he was kind enough to see me right away. He sent me to the hospital for chest x-rays, blood tests and an electrocardiogram. After more poking and prodding, I was left in an emergency room with my "peek-a-boo" nightgown and hooked up to a monitor.

Chemical burns? I lay there in pain for about three or four hours, not knowing what was going on with my body or my career. My doctor told me I had pneumonia, brought on by chemical burns to my lungs. I was discharged at about 7.30pm, and told to return in the morning for more tests.

In the hospital next morning, the chest X-ray showed slight improvement to my lungs. After some research with the local refueller, we discovered that there is also some diethylene glycol monomethyl ether (which is a fancy name for antifreeze) in with the kerosene and naphtha in Jet B.

The material safety data sheet says: "small amounts drawn into the lungs from swallowing or vomiting may cause severe health problems such as bronchopneumonia or pulmonary oedema". Bingo!

We had no way of knowing how much fuel I took in so more tests were performed: a urinalysis, more blood tests, a liver-function test and a really neat oxygen test (for this one they poke a needle right into an artery in the wrist).

My doctor calculated that less than four spoonfuls of Jet B in the lungs could be fatal.

With all this information, I was again discharged and told to wait for test results and not to fly until more was known. All of this started on Thursday, 25 September 1997, so I spent the weekend at home sick, in pain and grounded. On Monday, September 29, I again went to my doctor and he said the test results were good, but I still had pneumonia and should wait another week before my next x-rays and checkup.

I have noticed some vision loss and some memory loss. I don't know what the future will bring and God willing, I want to keep flying but, even if I don't, I hope this will help someone else not to do this.

– Tragically, Brian Toso was killed, along with his two passengers, in the crash of a Bell 206 less than a month after this fuel aspiration incident. The cause of the accident was not determined.

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ANALYSIS

Fuels ain't fuels

Dr David Newman

THE AVIATION FUELS USED IN Australia, Jet A1 and Avgas 100, are less toxic than Jet B which is commonly used in Canada and other parts of the world. However, all fuels should be treated with respect, and regarded as toxic.

Material safety data sheets are available for all grades of aviation fuel, and contain sound, practical advice and guidance on how to deal with all aspects of these chemicals. The MSDS for both Avgas 100 and Jet A1 clearly state "do not siphon product by mouth" – sound advice, indeed.

Jet A1: Fortunately Jet A1 does not contain additives such as benzene and is consequently less harmful to people accidentally exposed to it than Jet B. That's not to say that siphoning Jet A1 is safe. It can cause stinging in the eyes, skin irritation, nausea and diarrhoea in large doses, and respiratory tract irritation. And, like Jet B it is also capable of causing a fatal chemical pneumonitis following accidental aspiration into the lungs.

Avgas 100: Less toxic than Jet A1, Avgas will cause transient stinging to the eyes, diarrhoea and nausea if swallowed in sufficient doses. It also results in irritation to the respiratory tract if inhaled. The low level of benzene contained in Avgas is unlikely to cause a problem following a single, small-dose accidental inhalation. Long-term exposure, such as deliberate ingestion or inhalation, may lead to serious health problems.

Accident investigation: Did this pilot's jet fuel aspiration incident lead to his subsequent fatal accident? While the accident investigation conducted by the Transportation Safety Board of Canada did not uncover sufficient evidence to answer that question, it did make the following observations:

- The evidence gathered at the crash scene was similar to that of a weather-related accident where the pilot becomes disoriented and loses control of the helicopter due to the lack of visual cues. However, the reported weather from persons in the local area provides no supporting evidence that unusual weather patterns were present.
- "The pilot had an atherosclerotic coronary heart disease. The disease was of a degree that could produce sudden unconsciousness due to abnormal heart beats, called cardiac arrhythmia. Microscopic examination of the lungs revealed no residual incapacitating changes from his jet fuel exposure.
- "There is insufficient medical information available to determine the influence of the 25 September 1997 jet fuel inhalation incident.
- "The possibility that atherosclerotic coronary artery disease caused the pilot to lose consciousness or become disorientated and then to lose control of the helicopter could not be ruled out."

Given this information, it is tempting to believe that the pilot somehow experienced an incapacitating event in the cockpit and subsequently lost control of the aircraft. The post-mortem examination revealed no lasting effects from his pneumonitis, and his advanced coronary artery disease had apparently not declared itself prior to the crash. There is no indication in the story written by Mr Toso that he had ever had any cardiac symptoms, or was on any medication or treatment.

> **"Could [an] arrhythmia have caused him to become unconscious during the flight, leading to a loss of aircraft control?"**

Loss of consciousness: The accident report does not say whether any evidence of a heart attack was found on post-mortem examination. Did he have a heart attack at the controls? Apparently not. Did he suffer a temporary cardiac problem, not resulting in permanent changes to his heart, that may have rendered him incapacitated or unconscious?

The material safety data sheet for Jet B states that both naphtha and N-hexane are cardiac sensitisers and may lead to altered heart rhythms. Such an arrhythmia could result in incapacitation, especially given the pilot's degree of coronary artery disease.

At the time of his fuel aspiration, an electrocardiogram was reported to be normal. He did not have any further ECGs. Could he have developed an arrhythmia some time after his fuel aspiration incident, due to exposure to the additives? Could this arrhythmia have caused him to become unconscious at some point during the accident flight, leading to loss of aircraft control?

Given the available evidence, and in the absence of any other information, I believe that this sequence of events could well explain this tragic accident. However, this is an enormously difficult speculation to prove, and the actual cause of the accident will probably never be known.

Irrespective of this, readers should be aware that Australian Civil Aviation Regulation 6.16A states that a pilot must not fly if his or her ability to do so could be impaired by illness or injury, no matter how minor. Also, if the impairment lasts for more than seven days (30 days in the case of private and student pilot licence holders) the pilot is not permitted to fly until a designated aviation medical examiner (DAME) certifies that the impairment no longer exists.

There was no record found to indicate that Brian Toso had been re-examined by an aviation medical examiner after his jet fuel exposure. It's possible that such an examination could have saved his life.

The full transcript of the Transportation Safety Board of Canada's investigation into Brian Toso's death is reproduced at <www.casa.gov.au/prod/fsa/sep_99.htm>

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