NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

November 22, 2019

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Medical Officer

A. ACCIDENT: ANC19FA042; Girdwood, Alaska

On August 4, 2019, about 1627 Alaska daylight time, a Piper PA22-150 airplane, N7402D, was destroyed by impact forces and a postcrash fire when it collided with steep, mountainous terrain, about 5 miles north of the Girdwood Airport (AQY), Girdwood, Alaska. The airplane was registered to a private individual and operated by the pilot as a visual flight rules (VFR) flight under the provisions of Title 14 *Code of Federal Regulations* Part 91. Of the four occupants on board, the airline transport pilot, who was also a certified flight instructor, the student pilot-rated passenger, who was the registered owner of the airplane, and two additional passengers were fatally injured. Visual meteorological conditions prevailed, and no flight plan had been filed. According to witnesses, the flight departed AQY about 1615.

B. GROUP IDENTIFICATION

No group was formed for the medical evaluation in this accident.

C. DETAILS OF INVESTIGATION

Purpose

This investigation was performed to evaluate the pilot for medical conditions, the use of medications/illicit drugs, and the presence of toxins.

Methods

The Federal Aviation Administration (FAA) initial medical case review and the left-seated pilot's autopsy and the left-seated pilot's and student pilot-rated passenger's FAA Forensic Sciences laboratory toxicology[1] reports were reviewed. Other pertinent scientific and regulatory issues were reviewed.

[1] The FAA Forensic Sciences Laboratory tests for more than 1,300 substances including toxins, common prescription and over-the-counter medications as well as illicit drugs. See: http://jag.cami.jccbi.gov/toxicology/.

Left-seated pilot

FAA Medical Case Review

According to the FAA initial medical case review, the 31-year-old male pilot held a second class medical certificate with the limitation that he wear corrective lenses. At the time of the most recent exam (2/26/2019), the pilot reported 2,700 total hours of civil flight experience. The pilot reported taking no medications and having had previous knee and shoulder injuries successfully treated by his orthopedic surgeon. No significant medical issues were identified by the Aviation Medical Examiner on this or prior exams.

Autopsy

According to the autopsy performed by the Alaska State Medical Examiner's Office, Anchorage, Alaska, the cause of death in the left-seated pilot was multiple blunt (deceleration-type) injuries to neck, chest, abdomen, and extremities due to aircraft incident/crash to ground and the manner of death was accident. According to the medical examiner, ethanol intoxication "may be viewed as a factor contributing to death." There was no evidence of smoke inhalation. No significant natural disease was identified.

Toxicology

Postmortem toxicological testing by the Alaska State Medical Examiner of the left-seated pilot's femoral blood was positive for ethanol at 0.226 grams per deciliter (gm/dL); his blood carboxyhemoglobin level was 8.1%.[2] FAA toxicology testing detected ethanol in cavity blood at 0.252 gm/dL and vitreous fluid at 0.238 gm/dL. Methanol was detected in cavity blood and vitreous fluid. No carboxyhemoglobin was detected in cavity blood.

Student pilot-rated passenger

FAA Medical Case Review

According to the FAA medical case review, the 55-year-old male passenger had never applied for a medical certificate. He held a student pilot certificate issued on 9/23/2017.

Toxicology

FAA toxicology testing detected ethanol in the passenger's vitreous fluid at 0.058 gm/dL and in brain and muscle at 0.055 and 0.038 grams per hectogram, respectively. The sedating antihistamine diphenhydramine[3] was detected in liver and muscle tissue. Glucose was measured in vitreous fluid at 0.020 gm/dL.[4] The passenger's blood specimen was unsuitable for testing carboxyhemoglobin.

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[2] Carbon monoxide is an odorless, colorless, nonirritating gas formed by hydrocarbon combustion. Carboxyhemoglobin (COHb) is formed when carbon monoxide binds to hemoglobin. The binding results in impaired oxygen transport and use, leading to symptoms. Non-smokers generally have less than 1.5% COHb, smokers may have values as high as 9%. Symptoms usually begin to appear at 10-20%. Early symptoms may include headache, drowsiness, and dizziness. 50%-80% COHb levels are potentially deadly. https://medlineplus.gov/ency/article/003371.htm

[3] Federal Aviation Administration. Updated 1/16/19. Forensic Toxicology's WebDrugs. Diphenhydramine. http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=50.

[4] Federal Aviation Administration. Updated 1/16/19. Forensic Toxicology's WebDrugs. Glucose. Vitreous glucose concentrations usually range between 0.030 and 0.070 gm/dL. FAA considers vitreous glucose levels above 0.125 gm/dL as abnormal. http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=69

Ethanol

Ethanol is a social drug commonly consumed by drinking beer, wine, or liquor. Ethanol acts as a central nervous system depressant; it impairs judgment, psychomotor functioning, and vigilance. Effects of ethanol on aviators are generally well understood; it significantly impairs pilots' performance, even at very low levels.[5] FAA regulation Section 91.17 (a) prohibits any person from acting or attempting to act as a crewmember of a civil aircraft while having 0.040 gm/dL or more ethanol in the blood.[6]

Ethanol is water soluble, and after absorption it quickly and uniformly distributes throughout the body's tissues and fluids. The distribution pattern parallels water content and blood supply of the tissue. A small amount of ethanol can be produced after death by microbial activity, usually in conjunction with other alcohols such as methanol; vitreous humor does not suffer from such production. Post-absorption, vitreous humor has about 12% more ethanol than blood. [7]

While the acute effects of ethanol can vary depending on an individual's frequency of use, body weight, and tolerance, in general, at blood ethanol concentrations as low as 0.02 gm/dL there is relaxation and some loss of judgment and at 0.05 gm/dL there is further degradation of judgment, psychomotor functioning, and alertness. At blood ethanol concentrations above 0.10 gm/dL, there is prolonged reaction time, altered perception of the environment, lack of coordination, slowed thinking, and mood and behavioral changes. Above 0.15 gm/dL, individuals may have significant loss of muscle control and major loss of balance. In addition to worsening motor coordination and disorientation, at concentrations above 0.20 gm/dL, individuals may experience amnesia or blackouts and double vision.[8,9]

D. SUMMARY OF MEDICAL FINDINGS

The 31-year-old male left-seated pilot had no reported medical conditions or medication usage to the FAA. At the time of the accident, he held a current second class medical certificate with a limitation that he wear corrective lenses.

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[5] Cook, C.C.H. 1997. Alcohol and aviation. *Addiction* (Abingdon, England). 92(5):539-555.
[6] eCFR- Code of Federal Regulations. 91.17. Accessed 11/8/2019. Available from: http://www.ecfr.gov/cgi-bin/text-idx?rgn=div8&node=14:2.0.1.3.10.1.4.9
[7] Federal Aviation Administration. Updated 1/16/19. Forensic Toxicology's WebDrugs. Ethanol. http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=60
[8] Centers for Disease Control and Prevention. Blood Alcohol Concentration (BAC). https://www.cdc.gov/motorvehiclesafety/pdf/bac-a.pdf Accessed 11/13/2019
[9] Vonghia L., et al. 2008 Acute alcohol intoxication. *European Journal of Internal Medicine* 19: 561–567.

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The 55-year old male student pilot-rated passenger did not have a medical certificate. FAA toxicology testing of vitreous fluid was positive for ethanol at 0.058 gm/dL.