



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

May 4, 2021

Mary Pat McKay, MD, MPH
Chief Medical Officer

A. ACCIDENT: CEN19LA308; Whitehall, MI

Date and Time: September 9, 2019; 11:40 EDT

Injuries: 1 fatal

B. GROUP IDENTIFICATION

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

C. DETAILS OF INVESTIGATION

1. Purpose

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

2. Methods

The FAA medical case review, autopsy report, toxicology findings, and the investigator's reports were reviewed. Personal medical records regarding the pilot were also reviewed. Relevant regulation and medical literature were reviewed as appropriate.

FAA Medical Case Review

According to the FAA medical case review, the 79 year old male pilot reported 2,000 total flight hours as of his last medical exam, dated 11/4/1998. He had reported no chronic medical problems and no use of medications to the FAA. No significant abnormalities were identified on the physical exam and he was issued a third class medical certificate. The FAA has no later applications for medical certificates on file.

Autopsy

According to the autopsy performed by the Western Michigan School of

Medicine, Medical Examiner and Forensic Services, the cause of death was multiple injuries, and the manner of death was accident. The prostate was absent; the medical examiner commented this had been removed due to prostate cancer. In addition, mild atherosclerotic stenoses (<50%) in all three main coronary arteries were identified.

Toxicology

Toxicology testing performed by the FAA's Forensic Sciences Laboratory identified diphenhydramine, citalopram and its metabolite N-desmethylocitalopram in muscle and liver. No ethanol was identified in muscle or brain.

Toxicology testing performed by NMS Labs at the request of the medical examiner identified variable amounts of ethanol in spleen tissue.

Medication Descriptions

Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over the counter under the names Benadryl and Unisom. Diphenhydramine carries the following FDA warning: may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery).¹ Compared to other antihistamines, diphenhydramine causes marked sedation; it is also classed as a CNS depressant and this is the rationale for its use as a sleep aid. Altered mood and impaired cognitive and psychomotor performance may also be observed. In fact, in a driving simulator study, a single dose of diphenhydramine impaired driving ability more than a blood alcohol concentration of 0.100%.² The therapeutic range of diphenhydramine (range in which it is expected to cause effects) is 0.0250 to 0.1120 ug/ml.³ However, diphenhydramine undergoes postmortem redistribution; after death it can move back into pooled blood from storage sites. For diphenhydramine, postmortem central blood levels may increase by about three times.⁴

Citalopram/escitalopram are both antidepressants; they have the same metabolite and cannot readily be distinguished in the laboratory, particularly from organ tissues. The patient instructions state, "Because

¹ Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Diphenhydramine. Available from: <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=50> . Accessed 03/18/2018.

² Weiler JM, B.J., Woodworth GG, Grant AR, Layton TA, Brown TL, McKenzie DR, Baker TW, Watson GS., Effects of fexofenadine, diphenhydramine, and alcohol on driving performance. A randomized, placebo-controlled trial in the Iowa Driving Simulator. *Ann Intern Med* 2000. 132(5): p. 354-63.

³ Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Diphenhydramine. Available from: <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=50> . Accessed 03/13/2018.

⁴ Han E, et. al., Evaluation of postmortem redistribution phenomena for commonly encountered drugs, *Forensic Science International* 2012;219: 265–271.

psychoactive drugs may impair judgment, thinking, or motor skills, patients should be cautioned about operating hazardous machinery, including automobiles, until they are reasonably certain that escitalopram oxalate therapy does not affect their ability to engage in such activities.⁵ However, it has not been shown to degrade performance in psychological testing experiments using healthy volunteers.⁶ The effects on performance with long term use by persons with depression is not known.

However, major depression itself is associated with significant cognitive degradation, particularly in executive functioning.⁷ The cognitive degradation may not improve even with remission of the depressed episode, and patients with severe disease are more significantly affected than those with fewer symptoms or episodes.^{8,9} This is the reason the FAA requires pilots using antidepressants to be placed on a special issuance medical certificate.

Ethanol is the intoxicant commonly found in beer, wine, and liquor. It acts as a central nervous system depressant. After ingestion, at low doses, it impairs judgment, psychomotor functioning, and vigilance; at higher doses it can cause coma and death. The effects of ethanol on aviators are generally well understood; it significantly impairs pilots' performance, even at very low levels.¹⁰ Federal Aviation Regulations, 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.¹¹ Ethanol may also be produced in body tissues by microbial activity after death.¹² In this case, levels in different tissues may vary considerably.

Personal Medical Records

Personal medical records for the 3 years prior to the accident were reviewed including primary care records and some subspecialty care records. These revealed that the pilot had a longstanding history of high blood pressure, high cholesterol, an anxiety disorder, heartburn, and

⁵ National Institutes of Health. US National Library of Medicine. DailyMed. Escitalopram. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=d5fbc8ce-bd41-4bd0-b413-0dea97e596c3> Accessed 5/3/2021.

⁶ Paul MA, G.G., Love RJ, Lange M, *SSRI effects on psychomotor performance: assessment of citalopram and escitalopram on normal subjects*. *Aviat Space Environ Med*, 2007. **78**(7): 693-7.

⁷ Snyder HR. Major depressive disorder is associated with broad impairments on neuropsychological measures of executive function: A meta-analysis and review. *Psychol Bull*. 2013;139(1):81-132.

⁸ Nakano Y, Baba H, Maeshima H, Kitajima A, Sakai Y, Baba K, Suzuki T, Mimura M, Arai H. Executive dysfunction in medicated, remitted state of major depression. *J Affect Disord*. 2008;111(1):46-51.

⁹ Paelecke-Habermann Y, Pohl J, Leplow B. Attention and executive functions in remitted major depression patients. *J Affect Disord*. 2005;89(1-3):125-35

¹⁰ Cook, C.C., Alcohol and aviation. *Addiction* (Abingdon, England), 1997. 92(5): p. 539-555.

¹¹ US Government Printing Office .eCFR- Code of Federal Regulations. 91.17. Accessed 6/16/2015. Available from: <http://www.ecfr.gov/cgi-bin/text-idx?rgn=div8&node=14.2.0.1.3.10.1.4.9>.

¹² Federal Aviation Administration. Forensic Toxicology Drug Information. Ethanol. <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=60> Accessed 12/02/2016

prostate cancer treated with a prostatectomy. For these conditions, he used lisinopril to treat his blood pressure, atorvastatin to treat his high cholesterol, escitalopram to treat anxiety/depression. No mention is made in these records of the extent or seriousness of the pilot's anxiety/depression.

D. SUMMARY OF MEDICAL FINDINGS

The 79 year old male pilot had not applied for a medical certificate since 1998. At that time, he had reported no medical conditions or use of medications to the FAA

According to the autopsy performed by the Western Michigan School of Medicine, Medical Examiner and Forensic Services, the cause of death was multiple injuries and the manner of death was accident. The prostate was absent; the medical examiner commented this had been removed due to prostate cancer. In addition, mild atherosclerotic stenoses (<50%) all three main coronary arteries were identified. No other significant natural disease was identified.

Toxicology testing performed by NMS Labs at the request of the medical examiner identified variable amounts of ethanol in spleen tissue.

Toxicology testing performed by the FAA's Forensic Sciences Laboratory identified diphenhydramine, citalopram and its metabolite N-desmethylocitalopram in muscle and liver. No ethanol was identified in muscle or brain.

Personal medical records revealed that the pilot had a longstanding history of high blood pressure, high cholesterol, an anxiety disorder, heartburn, and prostate cancer treated with a prostatectomy. For these conditions, he used lisinopril to treat his blood pressure, atorvastatin to treat his high cholesterol, escitalopram to treat anxiety/depression. No mention is made in these records of the extent or seriousness of the pilot's anxiety/depression.