

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

December 12, 2023

A. CASE

NTSB ID: CEN22FA416
Location: Waller, Texas
Date: September 12, 2022

B. MEDICAL SPECIALIST

Specialist JE Tuttle MD MHA FACS
National Transportation Safety Board
Washington, DC

C. DETAILS

1.0 Description of Review

For purposes of evaluating the pilot for potentially impairing substances and potentially impairing medical conditions, the above Medical Specialist reviewed the following sources of medical information, along with selected relevant regulation, medical literature, and investigator reports.

- Final Federal Aviation Administration (FAA) medical case review
- Autopsy report - pilot (including accompanying toxicology and death investigation records)
- Toxicology report - pilot

2.0 Summary of Medical Facts

According to the FAA medical case review, the 74-year-old pilot never had an FAA medical certificate and had no FAA medical certification records on file.¹

The Harris County Institute of Forensic Sciences, Houston, Texas, performed the pilot's autopsy. According to the autopsy report, the pilot's cause of death was multiple blunt force injuries, and his manner of death was accident. Findings of natural disease included cerebral vessels with moderate-to-severe plaque, severe ulcerated and calcified plaque of the aorta, high-blood-pressure-associated kidney changes, moderate-to-severe coronary artery disease (including 85% narrowing of the left anterior descending artery, 40% of the left circumflex artery, and 20% of the right coronary artery), fatty streaks and thickening of the pulmonary arteries, and obesity (height 69 inches, weight 255 pounds). The heart was described as enlarged; heart weight was 380 grams (normal heart weight for a male of the pilot's body weight is roughly 320 – 560 grams), left ventricular wall thickness was 1.1 cm (normal is roughly 0.9-1.6 cm), right ventricular wall thickness was 0.2 cm (normal is roughly 0.2-0.6 cm), and interventricular septal thickness was 0.8 cm (normal is roughly 1-1.8 cm).² The heart muscle was pale and had areas of old scarring, and microscopic examination of the heart showed enlargement of the muscle cells, scar tissue, and hardening of blood vessels. The remainder of the autopsy examination did not identify other significant natural disease.

A death investigation report accompanying the autopsy report included documentation of medical history information obtained from the pilot's family, medical records, and hospital staff. According to the death investigation report, the pilot had a history of bladder cancer (unknown status at the time of the accident), benign enlarged prostate with urinary retention and recurrent urinary tract infections, and a prior gastric sleeve surgery for weight loss. His family reported that the pilot had recently started semaglutide (marketed as Ozempic) for weight loss under the care of his primary care physician. His family denied any new health complaints in the weeks prior to the accident.

Postmortem toxicological testing by the Harris County Institute of Forensic Sciences did not detect any tested-for substances in the pilot's heart blood.³

¹ According to the FAA medical case review, the accident aircraft was classified as glider. FAA medical certification is not required to pilot a glider.

² Kitzman DW, Scholz DG, Hagen PT, Ilstrup DM, Edwards WD. Age-related changes in normal human hearts during the first 10 decades of life. Part II (maturity): a quantitative anatomic study of 765 specimens from subjects 20 to 99 years old. *Mayo Clin Proc.* 1988;63(2):137-146. doi:10.1016/s0025-6196(12)64946-5.

³ The toxicology report listed tested-for substances as ethanol, acetone, isopropanol, methanol, oxycodone, benzoylecgonine, amphetamine/MDA, methamphetamine/MDMA, phencyclidine, and

FAA postmortem toxicology testing detected citalopram in liver tissue and at 1040 ng/mL in heart blood.⁴ The citalopram metabolite n-desmethylocitalopram was detected in liver tissue and at 148 ng/mL in heart blood. Carboxy-delta-9-THC was detected at 1.8 ng/mL in heart blood and 4 ng/ml in lung tissue.

Citalopram is a prescription medication commonly used to treat major depression.⁵ Major depression can cause cognitive impairment, particularly of executive function, and antidepressant treatment may improve such impairment.^{6,7} Research on motor vehicle crash risk indicates that depression, antidepressants, or the combination of depression and antidepressants may present a safety hazard, but the independent contributions of antidepressants to that hazard generally are not well-defined.⁸ In healthy individuals, studies of citalopram have not established that it causes cognitive or psychomotor impairment.^{9,10} However, citalopram sometimes carries a warning that any psychoactive drug may impair judgment, thinking, or motor skills, and that users should be cautioned about operating hazardous machinery, including automobiles, until they are reasonably certain that citalopram does not affect their ability to engage in such activities. Citalopram also carries a warning that reduced maximum dosing should be used in individuals over 60 years of age, and that the drug should be avoided in the presence of certain underlying conditions including recent heart attack, due to an increased risk of heart rhythm disturbances.⁵ A pilot on citalopram may be considered for FAA medical certification via special issuance only, due to the required detailed evaluation of the individual pilot's condition, including assessment of the pilot's cognitive function and response to

opiates.

⁴ The FAA Forensic Sciences laboratory has the capability to test for around a thousand substances including toxins, prescription and over-the-counter medications, and illicit drugs.

⁵ National Institutes of Health National Library of Medicine. Celexa. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=4259d9b1-de34-43a4-85a8-41dd214e9177>. Updated October 9, 2023. Accessed December 14, 2023.

⁶ 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. doi:10.1037/a0028727.

⁷ Prado CE, Watt S, Crowe SF. A meta-analysis of the effects of antidepressants on cognitive functioning in depressed and non-depressed samples. *Neuropsychol Rev.* 2018 Mar;28(1):32-72. doi: 10.1007/s11065-018-9369-5.

⁸ Hill LL, Lauzon VL, Winbrock EL, Li G, Chihuri S, Lee KC. Depression, antidepressants and driving safety. *Inj Epidemiol.* 2017;4(1):10. doi:10.1186/s40621-017-0107-x.

⁹ Fairweather DB, Pozzo CD, Kerr JS, Lafferty SV, Hindmarch I. Citalopram compared to dothiepin and placebo: effects on cognitive function and psychomotor performance. *Hum Psychopharmacol.* 1997;12(2):119-126.

¹⁰ Paul MA, Gray QW, Love RJ, Lange M. SSRI effects on psychomotor performance: assessment of citalopram and escitalopram on normal subjects. *Aviat Space Environ Med.* 2007;78(7):693-697.

medication.¹¹ Typical treatment concentrations of citalopram in a living person's plasma are about 50 ng/mL to 110 ng/mL, with the drug's concentration in whole blood typically being about 1.3-1.4 times the concentration in plasma.^{12,13} Citalopram concentrations in postmortem heart blood cannot be directly compared to established ranges in living individuals, because of citalopram's potential for postmortem redistribution.^{13,14} N-desmethylocitalopram is a metabolite of citalopram.

Carboxy-delta-9-THC is a non-psychoactive metabolite of delta-9-THC. Delta-9-THC (which was not detected in this case) is the primary psychoactive chemical in marijuana and hashish, which are products derived from the cannabis plant. Delta-9-THC may be smoked or ingested recreationally by users seeking mind-altering effects. It may also be used medicinally to treat illness-associated nausea, chronic pain, chronic diseases such as multiple sclerosis, and appetite loss.¹⁵ Psychoactive effects of THC vary depending on the user, user history of use, dose, and route of administration, and may impair motor coordination, reaction time, decision making, problem solving, and vigilance.¹⁶ Delta-9-THC is a federally controlled substance, and the FAA considers it unsuitable for flying, regardless of state cannabis laws.^{17,18,19}

¹¹ Federal Aviation Administration. Guide for aviation medical examiners: decision considerations - aerospace medical dispositions, item 47, psychiatric conditions - use of antidepressant medications. Federal Aviation Administration website. https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/app_process/exam_tech/item47/amd/antidepressants. Updated June 28, 2023. Accessed December 14, 2023.

¹² Schulz M, Schmoldt A, Andresen-Streichert H, Iwersen-Bergmann S. Revisited: Therapeutic and toxic blood concentrations of more than 1100 drugs and other xenobiotics. *Crit Care*. 2020;24(1):195. Published 2020 May 6. doi:10.1186/s13054-020-02915-5

¹³ Baselt RC. *Disposition of Toxic Drugs and Chemicals in Man*. 11th ed. Biomedical Publications; 2017.

¹⁴ Lewis RJ, Angier MK, Johnson RD, et al. Analysis of Citalopram and Desmethylocitalopram in Postmortem Fluids and Tissues Using Liquid Chromatography-Mass Spectrometry. DOT/FAA/AM-11/17. Office of Aerospace Medicine Washington, DC 20591. October 2011.

¹⁵ Shah J, Fermo O. Review of systemic and syndromic complications of cannabis use: A review. *Medicine* (Baltimore). 2022;101(49):e32111. doi:10.1097/MD.00000000000032111, 10.1097/MD.00000000000032111.

¹⁶ Testai FD, Gorelick PB, Aparicio HJ, et al. Use of Marijuana: Effect on Brain Health: A Scientific Statement From the American Heart Association. *Stroke*. . 2022;53(4):e176-e187. doi:10.1161/STR.0000000000000396, 10.1161/STR.0000000000000396.

¹⁷ Federal Aviation Administration. Guide for aviation medical examiners: pharmaceuticals (therapeutic medications) do not issue - do not fly. Federal Aviation Administration website. https://www.faa.gov/ame_guide/pharm/dni_dnf. Updated July 10, 2023. Accessed December 22, 2023.

¹⁸ Federal Aviation Administration. Aeromedical factors. In: *Pilot's Handbook of Aeronautical Knowledge*. FAA-H-8083-25C. Oklahoma City: United States Department of Transportation, Federal Aviation Administration, Airman Testing Standards Branch, AFS-630; 2023. https://www.faa.gov/sites/19_phak_ch17.pdf. Accessed December 22, 2023.

¹⁹ Federal Aviation Administration. Controlled substances and CBD products. Guide for Aviation Medical Examiners. https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/media/Controlled_Substances_and_CBD_Products.pdf. Updated May 25, 2022. Accessed December 22, 2023.

Submitted by:

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