

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

July 30, 2024

A. CASE

NTSB ID: ERA22FA391
Location: Jacksboro, Tennessee
Date: August 29, 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 69-year-old male pilot's last aviation medical exam was March 24, 1998. At that time, he reported no medication use or active medical conditions. He was issued a third-class medical certificate with

special restrictions; according to the FAA medical case review, the restrictions were not reported in FAA medical records. The examiner documented that the pilot had an "eye discrepancy" letter for defective vision in his left eye; according to the FAA medical case review, there was no corresponding letter in FAA medical records. The most recent FAA medical certificate had expired prior to the accident date.

The Regional Forensic Center of Knox County performed the pilot's autopsy, as authorized by the Campbell County Medical Examiner. According to the pilot's autopsy report, his cause of death was multiple and massive blunt force injuries, and his manner of death was accident. Examination of the brain revealed severe atherosclerosis of the cerebral arteries and the presence of a soft lacunar infarct of the left globus pallidus with early cavitation. Examination of the heart revealed mild cardiomegaly (370 g), with coronary artery atherosclerosis of 30% narrowing of the right coronary artery, and 50-60% narrowing of the left anterior descending artery.¹ Mitral and aortic valve calcifications were also noted, as was some myocardial muscle interlacing fibrosis. Moderate dilatation of the cardiac chambers and moderate to severe atherosclerosis of the aorta was also noted. Examination of the lungs revealed evidence of chronic obstructive pulmonary disease (COPD) and pulmonary hypertension. The examination of the kidneys revealed atherosclerotic disease consistent with changes of high blood pressure. The remainder of the autopsy, including of the heart and lungs, did not reveal additional significant natural disease.

At the request of the Knox County Medical Examiner's Office, NMS Labs performed toxicological testing of postmortem blood specimens of the pilot. Amlodipine and caffeine were presumptively detected.²

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem specimens of the pilot.³ Diphenhydramine, clopidogrel, and amlodipine were detected in cavity blood and urine.

Diphenhydramine is a sedating antihistamine medication widely available over the counter in multiple sleep aids and cold and allergy products. Diphenhydramine

¹ Predicted heart weight for the pilot would be 327-331 g based on his height and weight. 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 Clinic Proceedings. 1988;63(2):137-146. doi:[https://doi.org/10.1016/s0025-6196\(12\)64946-5](https://doi.org/10.1016/s0025-6196(12)64946-5).

² When a test result is described as presumptively positive, it indicates that the initial screening test has indicated a particular substance. However, the result is not confirmed and would require additional testing to verify the results. Information about blood testing procedures, including tested-for substances, is available on the NMS Labs website at Test Code, 8052B (postmortem, expanded, blood (forensic)).
<https://www.nmslabs.com/tests/8052B#overview>.

³ 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.

can cause cognitive and psychomotor slowing and drowsiness and often carries a warning that it may impair performance of tasks like driving and operating heavy machinery.^{4,5,6} The typical elimination half-life of diphenhydramine in plasma is about 3-14 hours.⁷ The FAA states that pilots should not fly within 60 hours of using diphenhydramine, to allow time for it to be cleared from circulation.^{8,9}

Clopidogrel is a prescription medication that prevents clotting. It is used to treat patients with previous histories of heart attacks including those who are managed medically and those who are managed with coronary revascularization (surgery or interventional cardiology procedures), and to reduce the rate of subsequent heart attacks. It is also used to reduce the risk of recurrent strokes in patients who have had previous non-hemorrhagic strokes.¹⁰ Amlodipine is prescription medication commonly used to treat high blood pressure, chronic stable angina, and as part of the medical management of coronary artery disease.¹¹ Caffeine is a central nervous system stimulant that is commonly ingested, including in coffee, tea, soft drinks, and chocolate. It is also an ingredient in certain anti-drowsiness

⁴ National Institutes of Health National Library of Medicine. Benadryl Allergy Liqui-Gels. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=bfeae100-e2d1-4607-be3b-2d9b15cd4f7f>. Updated May 17, 2023. Accessed January 8, 2024.

⁵ Couper FJ, Logan BK. *Drugs and Human Performance Fact Sheets*. National Highway Traffic Safety Administration. DOT HS 809 725. April 2014 (Revised). <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf>. Accessed January 8, 2024.

⁶ Moskowitz H, Wilkinson CJ. *Antihistamines and Driving-Related Behavior: A Review of the Evidence for Impairment*. National Highway Traffic Safety Administration. DOT HS 809 714. May 2004. <https://www.nhtsa.gov/sites/nhtsa.gov/files/antihistamines20text.pdf>. Accessed January 8, 2024.

⁷ Schulz M, Schmoltdt A, Andresen-Streichert H, Iwersen-Bergmann S. Revisited: therapeutic and toxic blood concentrations of more than 1,100 drugs and other xenobiotics. *Crit Care*. 2020;24(1):195. doi:10.1186/s13054-020-02915-5.

⁸ 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 January 8, 2024.

⁹ Federal Aviation Administration. Allergy - antihistamine & immunotherapy medication. Guide for Aviation Medical Examiners. https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/media/AllergyAntihistamineImmunotherapyMedication.pdf. Updated October 26, 2022. Accessed January 8, 2024.

¹⁰ National Institutes of Health National Library of Medicine. Plavix-clopidogrel tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=de8b0b67-eb25-4684-83b5-7ad785314227>. Updated September 22, 2022. Accessed July 17, 2024.

¹¹ National Institutes of Health National Library of Medicine. Amlodipine besylate tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=b52e2905-f906-4c46-bb24-2c7754c5d75b&audience=consumer>. Updated December 15, 2008. Accessed July 17, 2024.

medications and headache medications.¹² Clopidogrel, amlodipine, and caffeine are not generally considered impairing.

Submitted by:

JE Tuttle MD MHA FACS
Medical Officer

¹² National Institutes of Health National Library of Medicine. Caffeine. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6d9b3926-7198-5e00-e053-2a91aa0a9580>. Updated September 23, 2020. Accessed May 22, 2024.