

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

February 29, 2024

A. CASE

NTSB ID: ERA22FA199
Location: Covington, Georgia
Date: April 21, 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 private pilot and student 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.

- Federal Aviation Administration (FAA) medical case review
- Autopsy report - private pilot
- Toxicology report - private pilot
- Autopsy report - student pilot
- Toxicology report - student pilot

2.0 Summary of Medical Facts

2.1 Private Pilot

According to the FAA medical case review, the 49-year-old male private pilot's last aviation medical examination was December 12, 2016. At that time, the private pilot was 69 inches tall and weighed 154 pounds. He reported no medication use or active medical conditions. No significant medical concerns were identified, and he was issued a second-class medical certificate without limitation. The medical certificate was expired at the time of the crash.

The Division of Forensic Sciences, Georgia Bureau of Investigation for the State of Georgia performed the autopsy of the private pilot. According to the autopsy report, the private pilot's cause of death was blunt force injuries of the torso, probable blunt force injuries of the head and thermal injuries. His manner of death was accident. The autopsy did not reveal other significant natural disease. According to the autopsy report, postmortem blood testing for carboxyhemoglobin (a marker of carbon monoxide exposure) did not detect a significant quantity.

The FAA Forensic Sciences Laboratory performed postmortem toxicological testing of the private pilot.¹ No tested-for substances were detected.

2.2 Student Pilot

According to the FAA medical case review, the 33-year-old male student pilot's last aviation medical examination was January 26, 2022. At that time, he was 67 inches tall and weighed 199 pounds. He reported no medication use and no active medical conditions. No significant medical concerns were identified, and the student pilot was issued a second-class medical certificate without limitation.

The Division of Forensic Sciences, Georgia Bureau of Investigation for the State of Georgia performed the autopsy of the student pilot. According to the autopsy report, the student pilot's cause of death was inhalation of products of combustion and thermal injuries. His manner of death was accident. The autopsy did not reveal other significant natural disease. According to the autopsy report, postmortem blood testing for carboxyhemoglobin did not detect a significant quantity.

¹ 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.

The FAA Forensic Sciences Laboratory performed postmortem toxicological testing of the student pilot.¹ Amphetamine was detected in heart blood at 60 ng/mL, and urine, at 1531 ng/mL. Cetirizine was detected at a low level in heart blood, and in urine at 121 ng/mL.²

Amphetamine is a prescription Schedule II controlled substance. The category of drugs that have a similar chemical structure and produce similar effects to amphetamine are called amphetamines. Amphetamine may be prescribed for attention deficit/hyperactivity disorders (ADHA), narcolepsy, and obesity. Amphetamine usually carries a warning that the drug may impair the ability to operate a vehicle, vessel, or machinery and care should be taken until the effects of the drug are assessed after initiation of use.³ Amphetamine can be used recreationally for euphoric effects and to increase alertness and relieve fatigue. Chronic abuse of amphetamine may lead to psychosis, paranoia, auditory and visual hallucinations as well as dermatillomania (skin picking)³⁴ In addition to being a drug itself, amphetamine is a metabolite of methamphetamine, another drug in the amphetamines category. Recreational users of amphetamine seeking the intense euphoria produced by higher levels of drug, snort, smoke, or inject the drug. Blood concentrations may generally be used to distinguish therapeutic use from abuse. Concentrations of 20-50 ng/mL in blood are typical for therapeutic use, and up to 200 ng/mL have been documented. Concentrations greater than this, in living individuals, usually represents abuse. Normal concentrations in recreational use are 10 to 2500 ng/mL (median 600 ng/mL) depending on the route of administration and the time from consumption to testing. Concentrations above this range will likely be associated with severe, possibly life threatening, toxicity. The timing of peak blood amphetamine concentration depends on the administrative method: oral administration at 3 hours, smoking in a few minutes, and injection almost immediately. Positive urine results indicate use within 1 to 4 days.^{5, 6} In a study of eight volunteers, single administration of either 10 mg or 20 mg therapeutic doses

² Cetirizine was reported as "detected" in heart blood on the FAA toxicology report. According to an e-mail from an FAA forensic toxicologist, this indicates that the cetirizine concentration in the postmortem heart blood was significantly lower than cetirizine's typical therapeutic range in the blood of living people.

³ National Institutes of Health National Library of Medicine. Amphetamine sulfate- tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=53d40847-e0d3-48ec-81a7-ec5478553565>. Updated October 13, 2023. Accessed February 26, 2024.

⁴ National Highway Traffic Safety Administration (NHTSA). April 2014 (Revised). Drugs and Human Performance Fact Sheets. Methamphetamine (and Amphetamine). Accessed February 26, 2024. <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf>

⁵ Raouf M, Bettinger JJ, Fudin J. A Practical Guide to Urine Drug Monitoring. *Fed Pract.* 2018;35(4):38-44.

⁶ Oyler JM, Cone EJ, Joseph RE, Moolchan ET, Huestis MA. Duration of Detectable Methamphetamine and Amphetamine Excretion in Urine after Controlled Oral Administration of Methamphetamine to Humans. *Clinical Chemistry.* 2002;48(10):1703-1714. doi:<https://doi.org/10.1093/clinchem/48.10.1703>.

achieved a peak urine concentration range between about 2,000 and 6,000 ng/mL collected at 1.5 to 44 hours after dosing.⁷ There is postmortem redistribution of both amphetamine and methamphetamine and postmortem concentrations in blood may not always reflect antemortem drug concentrations. In comparing postmortem to antemortem blood levels, amphetamine and methamphetamine have, on average, 1.5 times higher levels in postmortem peripheral blood than antemortem blood. In addition, postmortem central blood levels when compared to peripheral blood levels range from 1.6 - 2.1 times higher.⁸ The FAA states that the use of amphetamines and the potential underlying conditions being treated may result in cognitive deficits that pose a risk to aviation safety. According to the FAA medical case review for this case, amphetamine use is disqualifying for FAA medical certification.^{9,10,11}

Cetirizine is a second-generation antihistamine medication that is available over the counter and is commonly used to treat allergy symptoms. Cetirizine typically carries a warning that users may experience drowsiness and should be careful when driving a motor vehicle or operating machinery.¹² Data on sedation and psychomotor impairment from cetirizine are mixed, with some studies but not others finding some

⁷ Oyler JM, Cone EJ, Joseph RE, Moolchan ET, Huestis MA. Duration of Detectable Methamphetamine and Amphetamine Excretion in Urine after Controlled Oral Administration of Methamphetamine to Humans. *Clinical Chemistry*. 2002;48(10):1703-1714. doi:<https://doi.org/10.1093/clinchem/48.10.1703>.

⁸ McIntyre IM, Nelson CL, Schaber B, Hamm CE. Antemortem and Postmortem Methamphetamine Blood Concentrations: Three Case Reports. *J of Anal Tox*. 2013;37(6):386-389. doi:<https://doi.org/10.1093/jat/bkt040>.

⁹ Code of Federal regulations. Mental standards for third-class airmen. 14 CFR 67.307(a)(b). <https://www.ecfr.gov/current/title-14/chapter-I/subchapter-D/part-67/subpart-D/section-67.307>. Updated February 16, 2024. Accessed February 26, 2024.

¹⁰ 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/media/DNI_DNF_tables.pdf. Updated June 28, 2023. Accessed February 26, 2024.

¹¹ Federal Aviation Administration, Guide for aviation medical examiners: Decision Considerations Disease Protocols-attention deficit hyperactivity disorders. Federal Aviation Administration Website. https://www.faa.gov/ame_guide/dec_cons/disease_prot/adhd. Last updated February 28, 2024. Accessed February 28, 2024.

¹² National Institutes of Health National Library of Medicine. Zyrtec Allergy. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=b165db38-b302-4220-8627-77cb07bb078c>. Updated May 19, 2023. Accessed February 27, 2024.

sedating and impairing effects.^{13,14,15} The FAA states that pilots should wait 48 hours after using cetirizine before flying, to allow time for the drug to be cleared from circulation.¹⁶

Submitted by:

JE Tuttle MD MHA FACS
Medical Officer

¹³ Adelsberg BR. Sedation and performance issues in the treatment of allergic conditions. *Arch Intern Med*. 1997;157(5):494-500.

¹⁴ 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 February 27, 2024.

¹⁵ Du Q, Zhou Y. Placebo-controlled assessment of somnolence effect of cetirizine: a meta-analysis. *Int Forum Allergy Rhinol*. 2016;6(8):871-879. doi:10.1002/alr.21746.

¹⁶ 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 February 27, 2024,