

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA22FA344

MEDICAL

Specialist's Factual Report

June 16, 2023

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A. ACCIDENT

Location: Melrose, Florida
Date: July 30, 2022

B. MEDICAL SPECIALIST

Specialist Turan Kayagil, MD, FACEP
National Transportation Safety Board
Washington, DC

C. DETAILS OF THE INVESTIGATION

1.0 Purpose

This investigation was performed to evaluate the flight instructor and pilot under instruction for potentially impairing substances and potentially impairing medical conditions.

2.0 Methods

The Federal Aviation Administration (FAA) medical case review and the autopsy and toxicology reports for the flight instructor and pilot under instruction were reviewed. Selected National Transportation Safety Board (NTSB) investigator reports and relevant regulation and medical literature were also reviewed.

D. FACTUAL INFORMATION

1.0 Flight Instructor

1.1 FAA Medical Case Review

According to the FAA medical case review, the 62-year-old male flight instructor's last aviation medical examination was on June 25, 1992. At that time, he reported 250 total civilian flight hours. He was 73 inches tall and weighed 197 pounds. He reported no medication use or active medical conditions. No significant issues were identified, and he was issued a third-class medical certificate without limitation. At the time of the accident, this certificate was expired. Notably, medical certification is not necessarily required for a pilot to exercise sport pilot privileges or privileges of a flight instructor certificate with a sport pilot rating, provided other requirements are met.¹

¹ [14 Code of Federal Regulations § 61.23.](#)

1.2 Autopsy

The Florida 4th District Medical Examiner's Office performed the flight instructor's autopsy. According to the flight instructor's autopsy report, his cause of death was multiple blunt injuries and his manner of death was accident. The extent of injury severely limited structural evaluation of the heart. Moderate aortic atherosclerosis was present, and the kidneys exhibited changes that may be seen with chronic high blood pressure. His autopsy did not identify other natural disease.

1.3 Toxicology

1.3.1 NMS Labs Toxicology Results

At the request of the Medical Examiner's Office, NMS Labs performed toxicological testing of postmortem liver tissue from the flight instructor.² NMS labs detected ethanol at 0.27 g/hg in the tested liver tissue.³

1.3.2 FAA Toxicology Results

The FAA Forensic Sciences laboratory also performed toxicological testing of postmortem specimens from the flight instructor.⁴ Ethanol was not detected in tested liver or brain tissue specimens. Fentanyl was detected in liver tissue at 0.4 ng/g, in lung tissue at 0.7 ng/g, and in kidney tissue at 1 ng/g; fentanyl testing in brain tissue was inconclusive, and fentanyl was not detected in bile. Hydroxyzine was detected in heart tissue but not in liver tissue. Losartan, amlodipine, and metoprolol were detected in liver tissue and muscle tissue. No blood was available for FAA testing.

1.3.3 Descriptions of Detected Substances

Ethanol is a type of alcohol. It is the intoxicating alcohol in beer, wine, and liquor, and, if consumed, can impair judgment, psychomotor performance, cognition, and vigilance.⁵ FAA regulation imposes strict limits on flying after consuming ethanol, including prohibiting pilots from flying with a blood ethanol level of 0.04 g/dL or greater.⁶ However, consumption is not the only possible source of ethanol in

² The NMS Labs report listed tested-for substances as: amphetamines, barbiturates, benzodiazepines, buprenorphine/metabolite, cannabinoids, cocaine/metabolites, fentanyl/acetyl fentanyl (reporting limit 1 ng/g), methadone/metabolite, methamphetamine/MDMA, opiates, oxycodone/oxymorphone, phencyclidine, ethanol, methanol, isopropanol, and acetone.

³ In tissue, concentrations in g/hg are approximately equivalent to concentrations in g/dL.

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 Cook CCH. Alcohol and aviation. *Addiction*. 1997;92(5):539-555.

⁶ [14 Code of Federal Regulations § 91.17](#).

postmortem specimens. Ethanol can be produced by microbes in a person's body after death. Postmortem ethanol production is made more likely by extensive traumatic injury and can cause an affected toxicological specimen to test positive for ethanol while another specimen from the same person tests negative.⁷

Fentanyl is an opioid drug that has CNS depressant effects. It may be used medicinally as a powerful prescription painkiller, or illicitly by users seeking a euphoric effect. Fentanyl used medicinally may be administered by injection, as a skin patch, by mouth, under the tongue, inside the cheek, or as a nasal spray. Fentanyl used illicitly may be injected, snorted, smoked, ingested, or taken under the tongue or inside the cheek. Illicit fentanyl may be sold alone or may be an adulterant in other illicit drugs. Fentanyl is a Schedule II controlled substance under federal law, with a high potential for abuse and dependence. Fentanyl can cause drowsiness, confusion, and dizziness. Fentanyl medication typically carries a warning that it may impair the mental or physical abilities required for the performance of potentially dangerous activities.^{8,9} The FAA considers fentanyl to be a "do not issue/do not fly" medication.¹⁰

Hydroxyzine is a prescription sedating antihistamine medication typically used for the treatment of itching, hives, and anxiety.¹¹ It may also be used to treat motion sickness/nausea or as a sleep aid. Sedating antihistamines can cause cognitive and psychomotor slowing and drowsiness.^{12,13} Hydroxyzine typically carries a warning that users should be cautioned against driving or operating dangerous machinery while taking the drug.¹¹ The FAA states that a pilot who uses a sedating antihistamine should not fly until sufficient time has elapsed for the drug to be cleared from

⁷ Kugelberg FC, Jones AW. Interpreting results of ethanol analysis in postmortem specimens: a review of the literature. *Forensic Sci Int.* 2007;165(1):10-29. doi:10.1016/j.forsciint.2006.05.004.

⁸ Drug Enforcement Administration. Fentanyl. Drug Fact Sheets. <https://www.dea.gov/factsheets/fentanyl>. Updated June 8, 2023. Accessed June 13, 2023.

⁹ National Institutes of Health National Library of Medicine. Actiq. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=90b94524-f913-48b3-3771-7b2fcfd888a>. Updated November 30, 2022. Accessed June 13, 2023.

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/go/dni>. Updated March 8, 2023. Accessed June 13, 2023.

¹¹ National Institutes of Health National Library of Medicine. Vistaril. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c271f97f-040e-492b-9194-2c8b74675a95>. Updated May 31, 2023. Accessed June 13, 2023.

¹² 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 June 13, 2023.

¹³ Gildea KM, Hileman CR, Rogers P, Salazar GJ, Paskoff LN. *Antihistamines and Fatal Aircraft Mishaps in Instrument Meteorological Conditions*. Federal Aviation Administration. DOT/FAA/AM-18/09. <https://rosap.ntl.bts.gov/view/dot/57211>. July 2018. Accessed June 13, 2023.

circulation.¹⁰ Additionally, some underlying conditions for which hydroxyzine is used may be disqualifying for FAA medical certification.

Losartan, amlodipine, and metoprolol are prescription medications of three different classes (angiotensin receptor blocker, dihydropyridine calcium channel blocker, and cardioselective beta blocker, respectively) that can be used to treat high blood pressure. Additionally, losartan and metoprolol each may be used in the treatment of heart attack and certain types of heart failure, amlodipine and metoprolol each may be used in the treatment of heart-related chest pain, and metoprolol may be used in the treatment of certain types of irregular heartbeat or to help prevent migraine headache.^{14 - 17}

2.0 Pilot Under Instruction

2.1 FAA Medical Case Review

According to the FAA medical case review, the last aviation medical examination of the 57-year-old female pilot under instruction was on March 5, 2022. At that time, she reported 350 total civilian flight hours. She was 64 inches tall and weighed 132 pounds. She reported taking multivitamins. She reported no other medication use or active medical conditions. No significant issues were identified, and she was issued a third-class medical certificate limited by a requirement to have available glasses for near vision.

2.2 Autopsy

The Florida 4th District Medical Examiner's Office performed the autopsy of the pilot under instruction. According to the autopsy report of the pilot under instruction, her cause of death was multiple blunt injuries and her manner of death was accident. The extent of injury severely limited structural evaluation of her heart. Her autopsy did not identify significant natural disease.

¹⁴ National Institutes of Health National Library of Medicine. Cozaar. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=9949448f-c3b9-44ee-94ed-c1aca8c90f39>. Updated June 1, 2022. Accessed June 13, 2023.

¹⁵ National Institutes of Health National Library of Medicine. Norvasc. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=abd6a2ca-40c2-485c-bc53-db1c652505ed>. Updated April 4, 2022. Accessed June 13, 2023.

¹⁶ National Institutes of Health National Library of Medicine. Lopressor. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=0283bc9d-6998-493a-824a-d4c85f704111>. Updated January 24, 2023. Accessed June 13, 2023.

¹⁷ Mann JFE, Flack JM. Choice of drug therapy in primary (essential) hypertension. In: Post TW, ed. *UpToDate*. Waltham, MA: UpToDate Inc. <https://www.uptodate.com/contents/choice-of-drug-therapy-in-primary-essential-hypertension>. Updated May 4, 2023. Accessed June 13, 2023.

2.3 Toxicology

2.3.1 NMS Labs Toxicology Results

At the request of the Medical Examiner's Office, NMS Labs performed toxicological testing of postmortem liver tissue from the pilot under instruction.² NMS labs detected ethanol in the tested liver tissue, but was unable to obtain a reproducible measurement of the ethanol concentration.

2.3.2 FAA Toxicology Results

The FAA Forensic Sciences laboratory also performed toxicological testing of postmortem specimens from the pilot under instruction.⁴ Diphenhydramine was detected in liver tissue and muscle tissue. Ethanol was not detected in liver tissue or brain tissue. There was no blood available for FAA testing.

2.3.3 Descriptions of Detected Substances

Diphenhydramine is a sedating antihistamine available over the counter in multiple sleep aids and cold and allergy products. Diphenhydramine can cause cognitive and psychomotor slowing and drowsiness. It typically carries a warning that it may impair performance of tasks like driving and operating heavy machinery.^{12, 18, 19} The FAA states that pilots should not fly within 60 hours of using diphenhydramine, to allow time for it to be cleared from circulation.^{10, 20}

Ethanol is described in section D.1.3.3 above.

E. SUMMARY OF MEDICAL FACTS

1.0 Flight Instructor

The 62-year-old male flight instructor's last aviation medical examination was on June 25, 1992. At that time, he reported no medication use or active medical conditions. He was issued a third-class medical certificate without limitation. At the time of the accident, this certificate was expired. Medical certification is not

¹⁸ 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 June 13, 2023.

¹⁹ 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 June 13, 2023.

²⁰ 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 June 13, 2023.

necessarily required for a pilot to exercise sport pilot privileges or privileges of a flight instructor certificate with a sport pilot rating.

According to the flight instructor's autopsy report, his cause of death was multiple blunt injuries and his manner of death was accident. The extent of injury severely limited structural evaluation of his heart. Moderate aortic atherosclerosis was present, and the kidneys exhibited changes that may be seen with chronic high blood pressure. His autopsy did not identify other natural disease.

The flight instructor's postmortem toxicological testing detected fentanyl in liver tissue at 0.4 ng/g, in lung tissue at 0.7 ng/g, and in kidney tissue at 1 ng/g; fentanyl testing in brain tissue was inconclusive, and fentanyl was not detected in bile. Hydroxyzine was detected in heart tissue but not in liver tissue. Losartan, amlodipine, and metoprolol were detected in liver tissue and muscle tissue. One laboratory detected ethanol at 0.27 g/hg in a liver tissue specimen; another laboratory did not detect ethanol in liver tissue and brain tissue specimens.

2.0 Pilot Under Instruction

The last aviation medical examination of the 57-year-old female pilot under instruction was on March 5, 2022. At that time, she reported taking multivitamins. She reported no other medication use or active medical conditions. She was issued a third-class medical certificate limited by a requirement to have available glasses for near vision.

According to the autopsy report of the pilot under instruction, her cause of death was multiple blunt injuries and her manner of death was accident. The extent of injury severely limited structural evaluation of her heart. Her autopsy did not identify significant natural disease.

Postmortem toxicological testing of the pilot under instruction detected diphenhydramine in liver tissue and muscle tissue. One laboratory detected ethanol in a liver tissue specimen but was unable to determine the ethanol concentration; another laboratory did not detect ethanol in liver tissue and brain tissue specimens.

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