

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

February 9, 2024

A. CASE

NTSB ID: CEN22FA436
Location: Allentown, Pennsylvania
Date: September 28, 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 surviving certified flight instructor (CFI) and fatally injured 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 – student pilot
- Toxicology reports – student pilot

2.0 Summary of Medical Facts

2.1 CFI

According to the FAA medical case review, the 34-year-old-male CFI's last aviation medical examination was December 19, 2017. No significant medical concerns were identified at that time, and he was issued a first-class medical certificate without limitation.

2.2 Student Pilot

The 49-year-old male student pilot's last aviation medical examination was November 24, 2021. At that time, he was 70 inches tall and weighed 164 pounds. He reported taking the prescription medication simvastatin, which is commonly used to treat high cholesterol and is not generally considered impairing. No significant medical concerns were identified, and the student pilot was issued a third-class medical certificate limited by a requirement to have available glasses for near vision, and (because of defective color vision) not valid for night flying or color signal control.

HNL Lab Medicine Forensic Pathology Associates performed an autopsy of the student pilot at the request of the Lehigh County Coroner's Office. The student pilot's cause of death was multiple injuries. The manner of death was due to aircraft mishap. The heart was described as enlarged with right ventricular dilation and mitral valve thickening. Heart weight was 420 grams (normal heart weight is roughly 260-440 grams for a male of body weight 164 pounds). The left and right cardiac ventricular walls and interventricular septum had thicknesses of 1.6 cm (normal is 0.9-1.6 cm), 0.2 cm (normal is 0.2-0.6 cm), and 1.6 cm (normal is roughly 1-1.8 cm), respectively.¹ The remainder of the autopsy did not reveal other significant natural disease.

HNL Lab Medicine performed postmortem toxicological testing of heart blood from the student pilot; this testing did not identify significant carboxyhemoglobin elevation or detect other tested-for substances.² The FAA Forensic Sciences Laboratory performed toxicological testing of the postmortem heart blood and urine

¹ 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.

² According to the HNL Lab Medicine report, tested-for categories of substances were: analgesics (including opioids), anesthetics, anthelmintics, anticholinergics, antidepressants, antidiarrheals, anticonvulsants, antihistamines, antihypertensives, antiparkinsons, anticholinergic, antitussive, designer opioids, hallucinogens, muscle relaxants, novel psychoactives, NSAIDs, opioid antagonists, sedative hypnotics, antianxiety, stimulants, cannabinoids, and volatiles.

of the student pilot.³ Delta-9-THC and 11-hydroxy-THC were detected in urine at 1.1 ng/mL and 18.2 ng/mL, respectively; neither was detected in heart blood. Carboxy-delta-9-THC was detected in heart blood and urine at 3 ng/mL and 69.3 ng/mL, respectively. In urine, morphine was detected at 29 ng/mL, codeine was detected at 104 ng/mL, dihydrocodeine was detected at 3 ng/mL, hydrocodone was detected at 15 ng/mL, and hydromorphone was detected at 1 ng/mL. Morphine, codeine, dihydrocodeine, hydrocodone, and hydromorphone were not detected in heart blood.

Delta-9-THC is the psychoactive component of cannabis. It is metabolized to 11-hydroxy-THC which is also psychoactive.⁴ Carboxy-delta-9-THC is a non-psychoactive metabolite of 11-hydroxy-THC. Delta-9-THC 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.⁵ Psychoactive effects of delta-9-THC vary depending on the user, user history of use, dose, and route of administration. Delta-9-THC may impair motor coordination, reaction time, decision making, problem solving, and vigilance.⁶ Delta-9-THC is a federally controlled substance, and the FAA considers it unsuitable for flying, regardless of state cannabis laws.^{7,8,9}

Morphine, codeine, dihydrocodeine, hydrocodone, and hydromorphone are opioid drugs. These drugs can be prescription medications, or metabolites of other

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.

⁴ Griver S, Henry R. The Ultimate Guide to Marijuana Metabolism. VAMCR.org. <https://vacmr.org/the-ultimate-guide-to-marijuana-metabolism/>. Updated February 4, 2021. Accessed January 16, 2024.

⁵ 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.0000000000003211.

⁶ 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.

⁷ 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.

⁸ 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/faa.gov/files/19_phak_ch17.pdf. Accessed December 22, 2023.

⁹ 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.

opioid drugs. Codeine is the only single medication that could account for all of these metabolites.¹⁰ As medications, morphine, codeine, dihydrocodeine, hydrocodone and hydromorphone are commonly used to treat pain. Codeine and hydrocodone are also used in prescription cough medications to relieve shortness of breath, and cough.^{10,11} Opioid medications often carry a warning that they may impair the mental or physical ability needed to perform potentially hazardous activities such as driving a car or operating dangerous machinery.^{12,13} Opioid drugs can also be used illicitly. An open prescription for an opioid medication is generally disqualifying for FAA medical certification, although certification may be granted by the FAA in certain cases of infrequent use for acceptable medical conditions. Regardless, the FAA states that a pilot should not fly after using an opioid like codeine until adequate time has elapsed for the drug to be eliminated from circulation.¹⁴

Submitted by:

JE Tuttle MD MHA FACS
Medical Officer

¹⁰ Smith HS. Opioid Metabolism. *Mayo Clin Proc.* 2009;84(7):613-624. doi:10.1016/S0025-6196(11)60750-7.

¹¹ National Institutes of Health National Library of Medicine. Hysingla ER. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=b7d23ac2-e776-9f62-3290-c64c2d6eb353>. Updated December 18, 2023. Accessed January 17, 2024.

¹² National Institutes of Health National Library of Medicine. CODEINE SULFATE tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=010905f9-3bcb-4b50-9fe8-a3ad0010f14c>. Updated December 15, 2023. Accessed February 9, 2024.

¹³ Research C for DE and. FDA updates prescribing information for all opioid pain medicines to provide additional guidance for safe use. FDA. <https://www.fda.gov/drugs/drug-safety-and-availability/fda-updates-prescribing-information-all-opioid-pain-medicines-provide-additional-guidance-safe-use>. Published online April 26, 2023; Accessed February 15, 2024.

¹⁴ 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 November 23, 2022. Accessed March 16, 2023.