

# National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



## Medical Factual Memorandum for Record

December 3, 2024

### A. CASE

NTSB ID: ANC23FA031  
Location: Nuevo, California  
Date: March 24, 2023

### B. MEDICAL SPECIALIST

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

### C. DETAILS

#### 1.0 Description of Review

For purposes of evaluating the pilot and pilot-rated passenger 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 reports (with associated toxicology and death investigation reports) - pilot and pilot-rated passenger
- FAA Forensic Sciences Laboratory toxicology reports - pilot and pilot-rated passenger

## 2.0 Summary of Medical Facts

### 2.1 Pilot

The 61-year-old male pilot's last aviation medical examination was October 10, 2022. At that time, he reported a history of high blood pressure, which was noted to be qualified under Conditions Aviation Medical Examiners Can Issue (CACI) criteria. The pilot reported using the prescription blood pressure medications hydrochlorothiazide and lisinopril, as well as testosterone replacement. He was issued a third-class medical certificate limited by a requirement to have available glasses for near vision.

The Riverside County Sheriff's Office performed the pilot's autopsy. According to the pilot's autopsy report and accompanying records, his cause of death was multiple blunt force injuries, and his manner of death was accident. A 1 cm area of purple discoloration was noted in the posterior interventricular septum of the heart, as was tunneling of the midportion of the left anterior descending coronary artery of up to 4 mm in depth. No atherosclerotic coronary artery disease was identified. The autopsy did not otherwise identify significant natural disease. At the request of the Sheriff's Office, Bio-Tox Laboratories tested postmortem cavity blood from the pilot. Zolpidem was detected at 20 ng/mL.

The FAA Forensic Sciences Laboratory also performed toxicological testing of postmortem specimens from the pilot. Zolpidem was detected at 20 ng/mL in cavity blood and at 5 ng/mL in urine. Hydrochlorothiazide and lisinopril were detected in urine; testing was inconclusive for these substances in cavity blood. Chlorothiazide was detected in cavity blood and urine.

Zolpidem is a prescription sedating medication used for the short-term treatment of insomnia. It typically carries warnings about psychomotor impairment that can affect driving and other hazardous activities or activities requiring full mental alertness. Warnings include that it can cause sleepiness, dizziness, blurred or double vision, slowed thinking and motor skills, reduced alertness, and prolonged reaction times, and that impairment can occur in the absence of subjective symptoms.<sup>1,2</sup> A typical oral dose of zolpidem may cause significant impairment for 4-5 hours, with longer effects at higher doses.<sup>3</sup> In living people, zolpidem's typical therapeutic range

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<sup>1</sup> National Institutes of Health National Library of Medicine. Ambien. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c36cadf4-65a4-4466-b409-c82020b42452>. Updated August 19, 2024. Accessed December 3, 2024.

<sup>2</sup> National Institutes of Health National Library of Medicine. Ambien CR. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=404c858c-89ac-4c9d-8a96-8702a28e6e76>. Updated August 19, 2024. Accessed December 3, 2024.

<sup>3</sup> 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->

in plasma is about 80-160 ng/mL, with a blood-to-plasma zolpidem ratio of about 0.6-0.8, and an elimination half-life of about 1.5-4 hours.<sup>4,5</sup> Zolpidem concentrations in postmortem cavity blood cannot be directly compared to established ranges in living individuals, because cavity blood has a potential to be diluted or contaminated by other body fluids.<sup>6</sup> The FAA states that occasional (as opposed to everyday) use of zolpidem is allowable for pilots, but that pilots should wait 24-48 hours after using the drug (depending on the formulation used) before flying, to allow time for the drug to be cleared from circulation.<sup>7</sup>

Hydrochlorothiazide and lisinopril are prescription medications commonly used to treat high blood pressure. Chlorothiazide may be present as an impurity in hydrochlorothiazide, and is also a prescription diuretic medication. Hydrochlorothiazide, lisinopril, and chlorothiazide are not generally considered impairing.

## 2.2 Pilot-Rated Passenger

The 62-year-old male pilot-rated passenger's last aviation medical examination was April 23, 2012. At that time, he reported no medication use and no active medical conditions. He was issued a third-class medical certificate limited by a requirement to wear corrective lenses. This certificate subsequently expired. The pilot-rated passenger did not hold active FAA medical certification at the time of the crash.

The Riverside County Sheriff's Office performed the pilot-rated passenger's autopsy. According to the pilot-rated passenger's autopsy report and accompanying records, his cause of death was multiple blunt force injuries, and his manner of death was accident. His heart was described as large. Heart weight was 450 grams (normal heart weight is roughly 280-490 grams for a male of the pilot's autopsy body weight of 199 pounds).<sup>8</sup> The remainder of the autopsy, including visual examination of the

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[drugshumanperformfs.pdf](#). Accessed December 3, 2024.

<sup>4</sup> 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.

<sup>5</sup> Baselt RC. *Disposition of Toxic Drugs and Chemicals in Man*. 11th ed. Biomedical Publications; 2017.

<sup>6</sup> Dinis-Oliveira RJ, Vieira DN, Magalhães T. Guidelines for collection of biological samples for clinical and forensic toxicological analysis. *Forensic Sci Res*. 2017;1(1):42-51. doi:10.1080/20961790.2016.1271098.

<sup>7</sup> Federal Aviation Administration. Pharmaceuticals (Therapeutic Medications) Sleep Aids. Guide for Aviation Medical Examiners. [https://www.faa.gov/about/office\\_org/headquarters\\_offices/avs/offices/aam/ame/guide/media/AllergyAntihistamineImmunotherapyMedication.pdf](https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/media/AllergyAntihistamineImmunotherapyMedication.pdf). Updated July 23, 2020. Accessed December 3, 2024.

<sup>8</sup> 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.

heart, identified mild coronary artery disease and no other significant natural disease. At the request of the Sheriff's Office, Bio-Tox Laboratories tested postmortem blood from the pilot. Acetaminophen was detected.

The FAA Forensic Sciences Laboratory also performed toxicological testing of postmortem specimens from the pilot. Sildenafil and desmethylsildenafil were detected in urine; testing for these substances in cavity blood was inconclusive. Rivaroxaban was detected in cavity blood and liver tissue. Acetaminophen, atorvastatin, and amlodipine were detected in cavity blood and urine. Hydrochlorothiazide was detected in cavity blood and liver tissue, and chlorothiazide was detected in liver tissue; chlorothiazide testing in cavity blood was inconclusive.

Sildenafil is a prescription medication commonly used to treat erectile dysfunction, as a sexual enhancement aid, or in the treatment of certain other conditions, including pulmonary hypertension. Sildenafil is not typically impairing, although the FAA states that pilots should wait 8 hours after using it before flying, to monitor for side effects.<sup>9</sup> Desmethylsildenafil is an active metabolite of sildenafil.

Rivaroxaban is a prescription oral blood thinner medication used to reduce the risk of adverse cardiovascular events related to blood clots in a variety of conditions. Rivaroxaban is not typically impairing, although a pilot on rivaroxaban seeking FAA medical certification would be subject to assessment of the underlying condition and response to treatment, including a minimum observation time of 2 weeks after starting rivaroxaban.<sup>10</sup>

Acetaminophen is a medication available in a wide variety of over-the-counter products as a pain and fever reducer. Atorvastatin is a prescription medication commonly used to control cholesterol and reduce cardiovascular risk. Amlodipine is a prescription medication that can be used to treat high blood pressure and certain types of coronary artery disease. Hydrochlorothiazide and chlorothiazide are described in section C.2.1 above. Acetaminophen, atorvastatin, amlodipine, hydrochlorothiazide, and chlorothiazide are not generally considered impairing.

Submitted by:

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Medical Officer

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<sup>9</sup> Federal Aviation Administration. Pharmaceuticals (therapeutic medications) erectile dysfunction and benign prostatic hyperplasia medications. Guide for Aviation Medical Examiners. [https://www.faa.gov/about/office\\_org/headquarters\\_offices/avs/offices/aam/ame/guide/pharm/ed/](https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/pharm/ed/). Updated August 25, 2017. Accessed December 3, 2024.

<sup>10</sup> Federal Aviation Administration. Anticoagulants. Guide for Aviation Medical Examiners. In: [https://www.faa.gov/ame\\_guide/media/ame\\_guide.pdf](https://www.faa.gov/ame_guide/media/ame_guide.pdf). Updated April 27, 2024. Accessed December 3, 2024.