

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

July 21, 2025

A. CASE

NTSB ID: WPR24FA132
Location: Anaconda, Montana
Date: April 26, 2024

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 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
- FAA Forensic Sciences Laboratory toxicology report – pilot

2.0 Summary of Medical Facts

The 28-year-old male pilot's last aviation medical examination was March 20, 2024. At that time, he reported no active medical conditions and no medication use. He was issued a second-class medical certificate without limitation.

The Montana Medical Examiner's Office performed the pilot's autopsy. According to the pilot's autopsy report, his cause of death was multiple blunt force injuries, and his manner of death was accident. His autopsy did not identify any significant natural disease.

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem specimens from the pilot.¹ Diphenhydramine was detected at 118 ng/mL in subclavian blood and at 675 ng/mL in urine. Acetaminophen was detected in heart blood and urine.

Diphenhydramine is a sedating antihistamine medication widely available over the counter in multiple sleep aids and cold and allergy products. Diphenhydramine can cause cognitive and psychomotor slowing and drowsiness, and often carries a warning about driving and operating machinery.^{2,3,4} In one driving simulator study, a single dose of diphenhydramine impaired driving ability more than a blood alcohol level of 0.1 g/dL.⁵ The FAA states that pilots should not fly within 60 hours of using diphenhydramine, to allow time for it to be cleared from circulation.^{6,7}

The diphenhydramine concentration in a living person's plasma typically is about 1.3 times the diphenhydramine concentration in that person's whole blood.⁸ One small study of healthy adult males estimated that drowsiness may occur at

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.

² 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 November 8, 2024. Accessed July 21, 2025.

³ Couper F, Huestis M, Fulford J, et al. *Drugs and Human Performance Fact Sheets: 2024*. National Highway Traffic Safety Administration. DOT HS 813 650. December 2024 (Revised). <https://rosap.ntl.bts.gov/view/dot/78924>. Accessed July 21, 2025.

⁴ 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 July 21, 2025.

⁵ Weiler JM, Bloomfield JR, Woodworth GG, et al. Effects of fexofenadine, diphenhydramine, and alcohol on driving performance: a randomized, placebo-controlled trial in the Iowa Driving Simulator. *Ann Intern Med*. 2000;132(5):354-363. doi:10.7326/0003-4819-132-5-200003070-00004.

⁶ 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 July 21, 2025.

⁷ 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 July 21, 2025.

⁸ Baselt RC. *Disposition of Toxic Drugs and Chemicals in Man*. 11th ed. Biomedical Publications; 2017.

plasma diphenhydramine concentrations above about 30-40 ng/mL, and mental impairment may occur at plasma diphenhydramine concentrations above about 60 ng/mL.^{3,9} Comparing diphenhydramine concentrations in postmortem blood to established ranges in living individuals must be done cautiously, because diphenhydramine has significant potential for postmortem redistribution.^{8,10} Peripheral blood specimens generally are assumed to be less susceptible to postmortem drug redistribution effects than are central blood specimens.^{11,12} Subclavian blood, while typically considered a peripheral blood specimen, may have intermediate susceptibility to postmortem drug redistribution effects.¹³

Acetaminophen is a medication available without a prescription in a wide variety of products as a pain and fever reducer. Some such products also contain diphenhydramine. Acetaminophen is not generally considered impairing.

Submitted by:

Turan Kayagil, MD, FACEP
Chief Medical Officer

⁹ Gengo F, Gabos C, Miller JK. The pharmacodynamics of diphenhydramine-induced drowsiness and changes in mental performance. *Clin Pharmacol Ther.* 1989;45(1):15-21. doi:10.1038/clpt.1989.3.

¹⁰ Han E, Kim E, Hong H, et al. Evaluation of postmortem redistribution phenomena for commonly encountered drugs. *Forensic Sci Int.* 2012;219(1-3):265-271. doi:10.1016/j.forsciint.2012.01.016.

¹¹ Zilg B, Thelander G, Giebe B, Druid H. Postmortem blood sampling-Comparison of drug concentrations at different sample sites. *Forensic Sci Int.* 2017;278:296-303. doi:10.1016/j.forsciint.2017.07.006.

¹² Cook DS, Braithwaite RA, Hale KA. Estimating antemortem drug concentrations from postmortem blood samples: the influence of postmortem redistribution. *J Clin Pathol.* 2000;53(4):282-5. doi:10.1136/jcp.53.4.282.

¹³ Molina DK, Hargrove VM. Should postmortem subclavian blood be considered a peripheral or central sample? *Am J Forensic Med Pathol.* 2013;34(2):155-8. doi:10.1097/PAF.0b013e318288b0d5.