

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

May 8, 2025

A. CASE

NTSB ID: ERA23LA240
Location: Macon, North Carolina
Date: May 21, 2023
Time: About 2:47 p.m. local time

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
- Hospital post-accident medical treatment records
- Autopsy report (including associated toxicology and death investigation narrative information)
- FAA Forensic Sciences Laboratory toxicology report

2.0 Summary of Medical Facts

The 50-year-old male pilot's last aviation medical examination was December 14, 2021. At that time, he reported no medication use and no active medical conditions.¹ He was issued a third-class medical certificate without limitation.

Following the accident, the pilot was intubated on scene and transported by emergency medical services to a hospital burn center, where he was admitted with extensive burn injuries. His injuries were determined to be non-survivable and he was transitioned to comfort care. He was compassionately extubated and was declared dead at 7:36 p.m. on May 22, 2023.

The North Carolina Office of the Chief Medical Examiner performed the pilot's autopsy. According to the pilot's autopsy report, his cause of death was thermal injuries and inhalation of products of combustion, and his manner of death was accident. Coronary artery disease was present, with 50% narrowing of the left main and left anterior descending coronary arteries by plaque. The left circumflex and right coronary arteries had no narrowing. The heart muscle had an area of fibrosis (scar tissue consistent with old tissue damage from poor blood flow) measuring no larger than 1 cm, located in the left cardiac ventricle. Microscopic evaluation of left ventricular heart muscle showed fibrosis consistent with chronic poor blood flow with possible old heart attack. Surrounding heart cells were enlarged without acute inflammation or necrosis. The heart was not enlarged, dilated, or thickened. The remainder of the autopsy did not identify other significant natural disease. Extensive skin burns and airway soot were present.

A hospital ethanol test performed on blood collected from the pilot at 4:53 p.m. on the crash date (May 21, 2023) was negative. Hospital urine toxicology screening performed on urine collected from the pilot at 4:14 p.m. on May 22, 2023, detected only substances attributable to the pilot's post-crash medical care (as verified from hospital records).²

Toxicological testing performed by the Office of the Chief Medical Examiner on antemortem blood collected from the pilot at 4:53 p.m. on the crash date measured carboxyhemoglobin at 11%.³ All other detected substances were attributable to the pilot's post-crash medical care.⁴ Ethanol was not detected.

¹ According to the FAA medical case review, the pilot had reported a history of seasonal allergies at a previous aviation medical examination.

² Specifically, positive results were reported for the pain medication fentanyl, as well as for opiates and benzodiazepines.

³ Carboxyhemoglobin is a marker of carbon monoxide exposure. Nonsmokers normally have carboxyhemoglobin levels of less than 1-3%, while heavy smokers may have levels as high as 10-15%.

⁴ Specifically, positive results were reported for fentanyl and the opiate/opioid pain medication hydromorphone.

The Office of the Chief Medical Examiner also screened postmortem vena cava blood from the pilot. This screening detected only substances attributable to the pilot's post-crash medical care.⁵

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem specimens from the pilot.⁶ Cetirizine was detected at 32 ng/mL in heart blood and at 223 ng/mL in liver tissue. Naproxen was detected in heart blood and liver tissue. All other detected substances were attributable to the pilot's post-crash medical care.⁷

Carboxyhemoglobin is formed when carbon monoxide binds to hemoglobin in blood, diminishing the blood's ability to deliver oxygen to body tissues. Carbon monoxide is an odorless, tasteless, colorless, nonirritating gas that can be produced during hydrocarbon combustion. Exposure to carbon monoxide usually occurs by inhalation of smoke or exhaust fumes. Nonsmokers normally have carboxyhemoglobin levels of less than 1-3%, while heavy smokers may have levels as high as 10-15%.⁸⁻¹²

Cetirizine is a second-generation antihistamine medication that is available over the counter and is commonly used to treat allergy symptoms.¹³ Cetirizine often carries a warning that users may experience drowsiness and should be careful when

⁵ Specifically, positive results were reported for opiates/opioids and the benzodiazepine sedative medication midazolam.

⁶ 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.

⁷ Specifically, fentanyl, its metabolite norfentanyl, hydromorphone, midazolam, and the stomach-acid-suppression medication famotidine were detected in heart blood and liver tissue.

⁸ Maloney GE. Carbon monoxide. In: Tintinalli JE, Ma OJ, Yealy DM, et al., eds. *Tintinalli's Emergency Medicine: A Comprehensive Study Guide*. 9th ed. New York, NY: McGraw-Hill Education; 2020:1414-1417.

⁹ Manaker S, Perry H. Carbon monoxide poisoning. In: Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <https://www.uptodate.com/contents/carbon-monoxide-poisoning>. Updated November 26, 2024. Accessed December 26, 2024.

¹⁰ Spitz WU. Asphyxia. In: Spitz WU, Spitz DJ, eds. *Spitz and Fisher's Medicolegal Investigation of Death: Guidelines for the Application of Pathology to Crime Investigation*. 4th ed. Springfield, IL: Charles C Thomas; 2006:783-845.

¹¹ Dolinak D, Matshes EW, Lew EO. Environmental injury. In: Dolinak D, Matshes EW, Lew EO, eds. *Forensic Pathology: Principles and Practice*. Burlington, MA: Elsevier Academic Press; 2005:239-258.

¹² Hampson NB, Piantadosi CA, Thom SR, Weaver LK. Practice recommendations in the diagnosis, management, and prevention of carbon monoxide poisoning. *Am J Respir Crit Care Med*. 2012;186(11):1095-1101. doi:10.1164/rccm.201207-1284CI.

¹³ Cetirizine sometimes is marketed as Zyrtec. The medication levocetirizine, which is one of two mirror-image cetirizine molecules, sometimes is marketed as Xyzal.

driving a motor vehicle or operating machinery.¹⁴ Data on sedation and psychomotor impairment from cetirizine are mixed, with some studies finding some sedating and impairing effects.^{15 - 22} 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.²³

Naproxen is an anti-inflammatory medication that is available without a prescription and commonly is used for control of pain and fever.²⁴ Naproxen is not generally considered impairing.

Submitted by:
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Chief Medical Officer

¹⁴ 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 February 11, 2025. Accessed May 7, 2025.

¹⁵ Adelsberg BR. Sedation and performance issues in the treatment of allergic conditions. *Arch Intern Med*. 1997;157(5):494-500.

¹⁶ Baselt RC. *Drug Effects on Psychomotor Performance*. Biomedical Publications; 2001.

¹⁷ Shamsi Z, Kimber S, Hindmarch I. An investigation into the effects of cetirizine on cognitive function and psychomotor performance in healthy volunteers. *Eur J Clin Pharmacol*. 2001;56(12):865-871. doi:10.1007/s002280000257.

¹⁸ 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 May 7, 2025.

¹⁹ Vacchiano C, Moore J, Rice GM, Crawley G. Fexofenadine effects on cognitive performance in aviators at ground level and simulated altitude. *Aviat Space Environ Med*. 2008 Aug;79(8):754-60. doi: 10.3357/asm.2212.2008.

²⁰ van Ruitenbeek P, Vermeeren A, Riedel WJ. Histamine H1 receptor antagonist cetirizine impairs working memory processing speed, but not episodic memory. *Br J Pharmacol*. 2010;161(2):456-466. doi:10.1111/j.1476-5381.2010.00907.x.

²¹ 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.

²² Snidvongs K, Seresirikachorn K, Khattiyawittayakun L, Chitsuthipakorn W. Sedative effects of levocetirizine: a systematic review and meta-analysis of randomized controlled studies. *Drugs*. 2017 Feb;77(2):175-186. doi: 10.1007/s40265-016-0682-0.

²³ 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 May 7, 2025.

²⁴ Naproxen sometimes is marketed as Aleve.