

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

July 1, 2025

A. CASE

NTSB ID: CEN23FA314
Location: Kearney, Missouri
Date: July 20, 2023
Time: About 9:34 a.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 National Transportation Safety Board (NTSB) 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 (including NMS Labs toxicology report) - pilot
- FAA Forensic Sciences Laboratory toxicology report - pilot

Additionally, at the request of the NTSB, Forensic Medical of Kansas arranged for the pilot's pacemaker to be interrogated by a representative of the pacemaker manufacturer. The NTSB Medical Specialist reviewed a summary report of this pacemaker interrogation, along with the pilot's cardiologist.

2.0 Summary of Medical Facts

The 79-year-old male pilot's last FAA aviation medical examination was April 1, 2021. At that time, he was 69 inches tall and weighed 212 pounds. He reported using the medications warfarin (a prescription blood thinning medication with various uses, including to help prevent stroke in patients with atrial fibrillation/flutter), spironolactone (a prescription diuretic medication), and carvedilol and losartan (prescription medications that can be used to treat high blood pressure and heart failure). He reported medical history including high blood pressure, which was noted to be qualified under Conditions Aviation Medical Examiners Can Issue (CACI) criteria, as well as 2011 hospitalization for cardiomyopathy, complete heart block, and atrial fibrillation with pacemaker placement in 2015. As a result of the pilot's April 2021 aviation medical examination, he was issued a second-class medical certificate via Special Issuance, limited by a requirement to wear corrective lenses, and not valid for any class after October 31, 2021. This medical certificate subsequently expired. The pilot completed a BasicMed educational course and reported completing a BasicMed Comprehensive Medical Examination Checklist (CMEC), both most recently in April 2023.¹

According to the FAA medical case review, the pilot had reported a heart rhythm problem in 2011, and had been diagnosed with non-ischemic cardiomyopathy with atrial flutter. In February 2012, he had been granted an Authorization for Special Issuance of medical certification for cardiomyopathy with use of medication; this Authorization had been withdrawn in December 2012 for cardiomyopathy with inadequate ejection fraction. He had appealed, seeking third-class medical certification, but had been denied in 2013 for the same reasons. He had had a pacemaker implanted in 2015, and had again been granted Authorization for Special Issuance. His most recent such Authorization had been in July 2021.

Forensic Medical of Kansas performed the pilot's autopsy for Clay County, Missouri. According to the pilot's autopsy report, his cause of death was inhalation of the products of combustion and thermal injuries, and his manner of death was accident. His autopsy identified evidence of hypertensive cardiovascular disease, with an enlarged heart and dilated cardiac ventricles. His cardiac pacemaker was identified and recovered. He had mild coronary artery disease and moderate aortic atherosclerosis. Evidence of chronic obstructive pulmonary disease was noted, with adhesions of the left lung. He had soot in his airways.

¹ BasicMed provisions allow pilots who meet certain requirements to fly as pilot in command or as a required flightcrew member without current medical certification. Among those requirements, a pilot must have completed a BasicMed education course within 24 calendar months and must have had a medical examination with a state-licensed physician using the CMEC within 48 months. Aircraft and operating restrictions apply.

The pilot's pacemaker interrogation summary report provided no clear evidence of a potentially impairing arrhythmia leading up to the time of the crash.² Episodes of elevated atrial rate lasting seconds to minutes, without rapid ventricular rate, were recorded hours before the crash.

At the request of Forensic Medical of Kansas, NMS Labs performed postmortem toxicological testing of femoral blood from the pilot. Carboxyhemoglobin was measured at 20%. Warfarin was detected at 0.68 µg/mL. Caffeine was presumptively detected (positive screen without a second test to confirm).

The FAA Forensic Sciences Laboratory also performed toxicological testing of postmortem specimens from the pilot.³ Carboxyhemoglobin was measured at 16% in femoral blood. Warfarin, carvedilol, and valsartan were detected in femoral blood and liver tissue.

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%.⁴⁻⁸

Warfarin is a prescription blood thinning medication with a variety of uses, including to help prevent stroke in people who have atrial fibrillation/flutter. Warfarin

² Times of day for events recorded by the pacemaker were not verified against an external source; the pilot's cardiologist indicated that such times typically would be accurate to within about a minute.

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 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.

⁵ 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 July 1, 2025.

⁶ 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.

⁷ 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.

⁸ 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.

is not typically impairing, although the medication and the conditions it treats may convey some medical risks. According to the FAA medical case review for this accident, warfarin is conditionally acceptable for pilots, requiring case-by-case Authorization for Special Issuance for medical certification.

Caffeine is a central nervous system stimulant that is commonly ingested, including in coffee, tea, soft drinks, and chocolate; caffeine also is an ingredient in certain anti-drowsiness medications and headache medications. Carvedilol and valsartan are prescription medications that can be used to treat high blood pressure and heart failure.⁹ Caffeine, valsartan, and valsartan are not generally considered impairing.

Submitted by:

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Chief Medical Officer

⁹ Notably, valsartan belongs to the same class of medication as losartan, which the pilot had reported using at his last aviation medical examination.