

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

December 21, 2023

A. CASE

NTSB ID: ERA22LA089
Location: Knoxville, Tennessee
Date: December 16, 2021

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 in command and second pilot for potential medical-related impairment, the above Medical Specialist reviewed the following sources of medical information, along with selected relevant regulation, medical literature, and investigator reports.¹

- Final Federal Aviation Administration (FAA) medical case review
- Autopsy report - second pilot
- Toxicology report - second pilot

¹ According to information obtained by the National Transportation Safety Board investigator in charge, the surviving pilot (pilot in command) was seated in the front left seat and was the pilot primarily manipulating the controls, while the fatally injured pilot (second pilot) was acting as a safety pilot in the front right seat and was teaching the surviving pilot how to use the heads-up display.

2.0 Summary of Medical Facts

2.1 Pilot In Command

The 30-year-old male pilot in command's last aviation medical examination before the crash was April 14, 2021. At that time, he reported no significant medical issues and had no significant physical examination findings. He was issued a third-class medical certificate limited by a requirement to wear corrective lenses.

2.2 Second Pilot

The 64-year-old male second pilot's last aviation medical examination was August 27, 2019. At that time, he reported no medication use and no active medical conditions. He was issued a third-class medical certificate without limitation.

The Davidson County Office of the Medical Examiner, Nashville, Tennessee, performed the second pilot's autopsy. According to the second pilot's autopsy report, his cause of death was thermal injuries and his manner of death was accident. The autopsy report described his heart as being enlarged with concentric thickening of the left cardiac ventricular wall. His heart weight was 530 grams.² His autopsy did not identify other significant natural disease. The autopsy report documented that the second pilot had died the day after the crash.

Postmortem toxicology testing of the second pilot was performed by NMS Labs at the request of the Office of the Medical Examiner. This testing detected morphine, fentanyl, and the fentanyl metabolite norfentanyl in femoral blood. Postmortem toxicology testing of the second pilot also was performed by the FAA Forensic Sciences Laboratory. This testing detected morphine, fentanyl, norfentanyl, etomidate, and lidocaine in heart blood and liver tissue. Midazolam was detected in liver tissue but not heart blood.

Morphine and fentanyl are opioid drugs that are commonly used as pain medications. Norfentanyl is a metabolite of fentanyl. Etomidate is an intravenous anesthetic medication. Lidocaine is a drug with uses including local numbing and cardiac resuscitation. Midazolam is a benzodiazepine medication commonly used for anesthesia and sedation. All these drugs are commonly administered during medical care following major injury. The tested toxicological specimens were postmortem specimens, collected after the second pilot's post-crash medical care.

² The second pilot's body weight was documented as 240 pounds at his last aviation medical examination, and as 260 pounds at autopsy (autopsy body weight may have been affected by post-crash resuscitation). Normal heart weight is roughly 400-540 grams for a male of body weight 240 pounds, and 430-560 grams for a male of body weight 260 pounds. [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.]

Submitted by:

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