



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

August 19, 2022

Turan Kayagil, MD, FACEP
Medical Officer

A. ACCIDENT INFORMATION

Identification: ERA21LA295

Location: Point Harbor, North Carolina

Date: July 19, 2021

B. GROUP IDENTIFICATION

No group was formed for the medical evaluation in this accident.

C. DETAILS OF INVESTIGATION

1. Purpose

This investigation was performed to evaluate the pilot for medical conditions, the use of medications/illicit drugs, and the presence of toxins.

2. Methods

The Federal Aviation Administration (FAA) medical case review and the pilot's FAA medical certification file were reviewed. The pilot's autopsy and toxicology reports were also reviewed, as were selected investigator reports and relevant regulation and medical literature.

3. Findings

a. FAA Medical Records

According to his FAA medical records, the 36-year-old male non-certificated pilot had his only aviation medical examination on January 29, 2021. At that time, he reported 5.1 total civilian flight hours. He was 73 inches tall and weighed 290 pounds. He reported no medication use and no active medical conditions. The examiner deferred the medical certification decision to the FAA due to the pilot reporting two previous driving under the influence (DUI) convictions. In response to FAA request, the pilot provided documentation

related to alcohol-related DUI offences that had occurred April 2006 and August 2013, resulting in convictions. Subsequent FAA investigation of the pilot's driving record found that the pilot had also been convicted of a third DUI offense that had occurred in July 2006. As of the accident date, the FAA was awaiting additional requested information from the pilot before making a final medical certification decision.

Also noted, in a June 28, 2021, letter to the FAA, the pilot stated he did not smoke.

b. Autopsy

The East Carolina University Brody School of Medicine, Department of Pathology and Laboratory Medicine, Division of Forensic Pathology performed the pilot's autopsy, at the request of the North Carolina Office of the Chief Medical Examiner. According to the autopsy report, the cause of death was multiple traumatic injuries. No thermal injury or airway soot was described. Changes associated with prolonged water immersion were noted. The autopsy did not identify significant natural disease.

c. Toxicology

The North Carolina Office of the Chief Medical Examiner performed toxicological testing of postmortem specimens from the pilot. This testing detected ethanol at 0.08 g/dL in cavity blood. The testing did not include measurement of carboxyhemoglobin.¹

The FAA Forensic Sciences Laboratory also tested postmortem specimens from the pilot.² Ethanol was detected at 0.093 g/dL in cavity blood, 0.097 g/dL in muscle, and 0.148 g/dL in brain. N-propanol was detected in cavity blood, muscle, and brain. N-butanol was detected in brain. The carboxyhemoglobin level in cavity blood was measured to be elevated at 19%.³

Of note, no specimen was available for carboxyhemoglobin testing of the passenger in this accident.

¹ The North Carolina Office of the Chief Medical Examiner toxicology report listed the tested-for substances as follows. In cavity blood: ethanol and organic bases. In spleen tissue: benzodiazepines, cocaine metabolite, gabapentin/pregabalin, and opiates/opioids.

² The FAA Forensic Sciences Laboratory tests specimens for over 1,300 substances including toxins, prescription and over-the-counter medications, and illicit drugs; information about those substances can be found at the Civil Aerospace Medical Institute WebDrugs website (<https://jag.cami.jccbi.gov/toxicology>).

³ Nonsmokers normally have carboxyhemoglobin levels of less than 1-3%, while heavy smokers may have levels as high as 10-15%.

d. Descriptions of Detected Substances

Ethanol is the intoxicating alcohol in beer, wine, and liquor. It can impair judgment, psychomotor performance, cognition, and vigilance.^{4,5} FAA regulation imposes strict limits on flying after consuming ethanol. This includes a prohibition on acting as a crewmember of a civil aircraft while having a blood ethanol level of 0.04 g/dL or greater.⁶ Ethanol can also be produced by microbes in a person's body after death.^{4,7} N-propanol and n-butanol are other alcohols that can be produced by microbes in a person's body after death.⁷

Carboxyhemoglobin is formed when carbon monoxide binds to hemoglobin in blood, impairing the blood's ability to deliver oxygen to body tissues (hypemic hypoxia). 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. Symptoms of low-level carbon monoxide exposure are nonspecific and variable, and may include headache, nausea, and tiredness. Increasing levels of exposure may become impairing or incapacitating, causing more serious neurocognitive, cardiac, and/or vision problems, progressing to death above carboxyhemoglobin levels of about 50% (or lower if other serious medical conditions co-exist), although symptoms are not simply predictable from carboxyhemoglobin levels. Nonsmokers normally have carboxyhemoglobin levels of less than 1-3%, while heavy smokers may have levels as high as 10-15%.^{8,9,10,11} Occasionally, when a person's body is immersed in water for a prolonged time after death, carbon monoxide may be produced in cavity blood/fluid, resulting in a postmortem increase in the cavity blood carboxyhemoglobin level.¹²

⁴ Spitz WU. Forensic aspects of alcohol. 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; 2006:1218-1229.

⁵ Cook CCH. Alcohol and aviation. *Addiction*. 1997;92(5):539-555.

⁶ [14 Code of Federal Regulations § 91.17](#).

⁷ Kugelberg FC, Jones AW. Interpreting results of ethanol analysis in postmortem specimens: a review of the literature. *Forensic Sci Int*. 2007;165(1):10-29. doi: 10.1016/j.forsciint.2006.05.004.

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 Clardy PF, 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 June 17, 2021. Accessed August 11, 2022.

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 Kojima T, Okamoto I, Yashiki M, et al. Production of carbon monoxide in cadavers. *Forensic Sci Int*. 1986;32(2):67-77. doi:10.1016/0379-0738(86)90141-6.

D. SUMMARY OF MEDICAL FINDINGS

The 36-year-old male non-certificated pilot's only aviation medical examination was on January 29, 2021. At that time, he reported no medication use and no active medical conditions. The examiner deferred the medical certification decision to the FAA due to the pilot reporting two previous driving under the influence (DUI) convictions. In response to FAA request, the pilot provided documentation related to alcohol-related DUI offences that had occurred April 2006 and August 2013, resulting in convictions. Subsequent FAA investigation of the pilot's driving record found that the pilot had also been convicted of a third DUI offense that had occurred in July 2006. As of the accident date, the FAA was awaiting additional requested information from the pilot before making a final medical certification decision.

The East Carolina University Brody School of Medicine, Department of Pathology and Laboratory Medicine, Division of Forensic Pathology performed the pilot's autopsy, at the request of the North Carolina Office of the Chief Medical Examiner. According to the autopsy report, the cause of death was multiple traumatic injuries. No thermal injury or airway soot was described. Changes associated with prolonged water immersion were noted. The autopsy did not identify significant natural disease.

Two laboratories performed toxicological testing of postmortem specimens from the pilot. One laboratory detected ethanol at 0.08 g/dL in cavity blood. The other laboratory detected ethanol at 0.093 g/dL in cavity blood, 0.097 g/dL in muscle, and 0.148 g/dL in brain. That laboratory also detected n-propanol in cavity blood, muscle, and brain; detected n-butanol in brain; and measured carboxyhemoglobin to be 19% in cavity blood.