National Transportation Safety Board
Office of Research and Engineering
Washington, DC 20594

Medical Factual Memorandum for Record
January 24, 2025

A. CASE

NTSB ID: CEN23FA125
Location: Port O' Connor, Texas
Date: March 6, 2023

B. MEDICAL SPECIALIST

Specialist JE Tuttle MD MHA FACS
National Transportation Safety Board
Washington, DC

C. DETAILS

1.0 Description of Review

For purposes of evaluating the pilot for potentially impairing medical conditions and substances, the above Medical Specialist reviewed the following sources of medical information, along with selected relevant regulation, medical literature, and investigator reports.

- Federal Aviation Administration (FAA) final medical case review
- Autopsy report - pilot
- Toxicology report – pilot

2.0 Summary of Medical Facts

The 56-year-old male pilot's last aviation medical examination was November 19, 2018. At that time, he reported no active medical conditions or medication use. He was issued a third-class medical certificate without limitation. The pilot's medical certificate expired in 2020. The pilot completed a BasicMed course, most recently in February 2023, and reported completing a Comprehensive Medical Examination Checklist (CMEC), most recently in November 2020.[1]

The Travis County Medical Examiner's Office performed the pilot's autopsy. According to the pilot's autopsy report, his cause of death was blunt trauma, and his manner of death was accident. Examination of the heart revealed ventricular and atrial dilatation, and the heart was described as enlarged.[2] The pilot's coronary arteries were reported to be normal without atherosclerotic disease. The remainder of the autopsy including the heart did not reveal other significant natural disease.

The autopsy report stated that the Medical Examiner's Office performed postmortem toxicological testing that did not detect the presence of ethanol or common drugs of abuse or elevation of carbon monoxide.[3]

The FAA Forensic Sciences Laboratory performed toxicology testing of postmortem specimens from the pilot.[4] Ethanol was detected in cavity blood at 0.012 g/dL; ethanol was not detected in vitreous fluid or urine. N-propanol and acetone were detected in cavity blood and were not detected in vitreous fluid or urine.[5]

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[1] BasicMed provisions allow pilots who meet certain requirements to fly without current medical certification. Among those requirements, a pilot must have completed a BasicMed training 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 also apply. For details, see 14 Code of Federal Regulations (CFR) Part 68, 14 CFR 61.113(3) and https://www.faa.gov/licenses_certificates/airmen_certification/basic_med/).

[2] The pilot weighed 223 pounds at his last aviation medical examination in 2018 and 168 pounds at autopsy. The heart weight at autopsy was 400 grams. Normal heart weight is roughly 300-520 grams for a male with a body weight of 223 pounds and roughly 260 – 450 grams for a male with a body weight of 168 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.

[3] According to an email from a forensic toxicologist at the Travis County Medical Examiner's Office, the pilot's cavity blood was screened for ethanol, acetone, isopropanol, methanol, amphetamine, barbiturate, benzodiazepines, fentanyl, cocaine metabolites, opiates, oxycodone, and cannabinoid. The pilot's vitreous fluid was also screened for ethanol, acetone, isopropanol, methanol. Aortic blood was screened for carbon monoxide.

[4] 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.

[5] According to an FAA forensic toxicologist, the acetone detected in blood was a semi-quantitative value of 1.16

Cetirizine was detected in cavity blood at 121 ng/mL and in urine at 794 ng/mL. Norchlorcyclizine was detected in cavity blood and urine. Sildenafil was detected in urine; testing of cavity blood for sildenafil was inconclusive. Desmethylsildenafil and acetaminophen were detected in cavity blood and urine.

Ethanol is a type of alcohol. It is the intoxicating alcohol in beer, wine, and liquor, and, if consumed, can impair judgment, psychomotor performance, cognition, and vigilance.[6] Alcohol consumption is not the only possible source of ethanol in postmortem specimens. Ethanol can sometimes be produced by microbes in a person's body after death. Postmortem ethanol production is made more likely by extensive traumatic injury and can cause an affected toxicological specimen to test positive for ethanol while another specimen from the same person tests negative.[7]

N-propanol is another alcohol that can be produced by microbes in a person's body after death. N-propanol's presence in a postmortem specimen is potentially indicative of postmortem microbial activity in the specimen but does not reliably indicate that postmortem ethanol production occurred. [7,8,9] Acetone is an organic compound that is used industrially and occurs naturally; its presence in postmortem specimens commonly is also attributable to postmortem microbial activity.[8]

Cetirizine is a second-generation antihistamine medication that is available over-the-counter and commonly is used to treat allergy symptoms. Cetirizine typically carries a warning that users may experience drowsiness with use, and should use caution when driving a motor vehicle or operating machinery.[10] Data on sedation and psychomotor impairment from cetirizine are mixed, with some studies finding some

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mg/dL (as the lower limit of detection was 2.5 mg/dL). The cutoff value for detection of acetone in vitreous or urine is less than 1 mg/dL.

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

[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] Boumba VA, Exadactylou P, Velivasi G, Ziavrou KS, Fragkouli K, Kovatsi L. The frequency of ethanol, higher alcohols, and other low molecular weight volatiles in postmortem blood samples from unnatural deaths. *Forensic Sci Int*. 2022; 341:111503. doi: 10.1016/j.forsciint.2022.111503.

[9] Gubala W. n-Butanol in blood as the indicator of how long a dead body lay in water. *Forensic Science International*. 1990;46(1-2):127-128. doi: https://doi.org/10.1016/0379-0738(90)90149-s

[10] 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 November 4, 2024. Accessed January 17, 2025.

sedating and impairing effects.[11,12,13] 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. Cetirizine may also be a metabolite of the antihistamine medication hydroxyzine (which was not detected in this case).

Norchlorcyclizine is an inactive metabolite of several medications that were not detected in this case, including hydroxyzine. Norchlorcyclizine may also be an impurity in some formulations of cetirizine.

Sildenafil is a prescription medication commonly used to treat erectile dysfunction, as a sexual enhancement aid, or in the treatment of certain other conditions, including pulmonary hypertension. Sildenafil is not typically impairing, although the FAA states that pilots should wait 8 hours after using it before flying, to monitor for side effects.[14] Desmethylsildenafil is a metabolite of sildenafil.

Acetaminophen is an over-the-counter medication commonly used to treat pain and reduce fever. It is commonly found in over-the-counter cold and headache medications.[15] Acetaminophen is not generally considered impairing.

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Medical Officer

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

[12] 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 February 27,2024.

[13] 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.

[14] Federal Aviation Administration. Pharmaceuticals (therapeutic medications) erectile dysfunction and benign prostatic hyperplasia medications. Guide for Aviation Medical Examiners. https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/pharm/ed/. Updated August 25, 2017. Accessed December 6, 2024.

[15]National Institutes of Health National Library of Medicine. Acetaminophen tablets. DailyMed. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c26f1872-ebff-4164-bf64-4272df43a2db. Updated February 3, 2021. Accessed January 17, 2025.