

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



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MEDICAL

Specialist's Factual Report

May 1, 2025

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A ACCIDENT

Location: Reliance, Tennessee

Date: May 7, 2023

B MEDICAL SPECIALIST

Specialist JE Tuttle MD MHA FACS
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Washington, DC

C DETAILS OF THE INVESTIGATION

1.0 Purpose

This investigation was performed to evaluate the pilot for potentially impairing medical conditions and substances.

2.0 Methods

The Federal Aviation Administration (FAA) medical case review and the pilot's autopsy and toxicology reports were reviewed. Selected investigator reports, scene photographs, and relevant regulation and medical literature were also reviewed.

D FACTUAL INFORMATION

1.1 FAA Medical Case Review

According to the FAA medical case review, the 54-year-old male pilot's last aviation medical examination was February 20, 2022. At that time, he reported 350 total civilian flight hours. He was 71 inches tall and weighed 188 pounds. He reported no active medical issues and no medication use. He was issued a second-class medical certificate with no limitation.

1.2 Autopsy

The Regional Forensic Center of Knox County performed the pilot's autopsy. According to the pilot's autopsy report, his cause of death was multiple blunt force trauma, and his manner of death was accident. Due to the severity of his injuries, his brain was not available for examination and his heart examination was limited. Within these limitations, his autopsy did not identify significant natural disease.

1.3 Toxicology

1.3.1 Autopsy Toxicology

At the request of the Regional Forensic Center of Knox County, NMS Labs performed toxicological testing of muscle tissue from the pilot.¹ Testing was presumptively positive for caffeine.² Hydroxychloroquine was detected at 240 ng/g. Ethanol was not detected (at a reporting limit of 0.08 g/hg).³

1.3.2 FAA Toxicology

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem tissue specimens from the pilot.⁴ Ethanol was detected in liver tissue at 0.014 g/hg and was not detected in brain tissue. Quetiapine was detected in liver tissue and was not detected in muscle. Amphetamine was detected in liver tissue at 38 ng/g and was detected in muscle tissue. Hydroxychloroquine, tadalafil, and acetaminophen were detected in liver and muscle tissue.

1.3.3 Descriptions of Detected Substances

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.⁵ FAA regulation imposes strict limits on flying after consuming ethanol, including prohibiting pilots from flying with a blood ethanol level of 0.04 g/dL or greater.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.⁷

¹ Information about blood testing procedures, including tested-for substances, is available on the NMS Labs website at Test Code [8052T](#).

² A presumptive positive indicates a substance is detected on a screening test without a second test to confirm presence or quantity of the detected substance.

³ In tissue, concentrations in g/hg are approximately equivalent to concentrations in g/dL.

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

⁶ 14 Code of Federal Regulations §91.17. General operating and flight rules. <https://www.ecfr.gov/current/title-14/chapter-I/subchapter-F/part-91>. Updated April 2, 2025. Accessed April 10, 2025.

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.

Quetiapine, sometimes marketed as Seroquel, is a prescription antipsychotic medication. In the United States, quetiapine is approved by the Food and Drug Administration (FDA) for treating schizophrenia, and conditions associated with bipolar disorder.⁸ Quetiapine is regularly prescribed for off-label (non-FDA-approved) uses, including treatment of insomnia without underlying psychiatric illness, as well as treatment of post-traumatic stress disorder and anxiety.^{9,10} Quetiapine may also be misused or abused, often in combination with other recreational substances.^{11,12} Quetiapine commonly causes drowsiness, especially in the initial days after starting a treatment regimen; users may develop tolerance to this effect over time. Quetiapine typically carries a warning that use has the potential to impair judgment, thinking, and motor skills, and that users should be cautioned about performing activities requiring mental alertness, such as operating a motor vehicle or hazardous machinery, until they are reasonably certain that the drug does not affect them adversely.⁸ The FAA considers quetiapine to be a “Do Not Issue/Do Not Fly” medication.¹³ According to the FAA medical case review for this accident, quetiapine is unacceptable for FAA medical certification due to the underlying conditions it is used to treat.

Amphetamine is a prescription medication and a Schedule II controlled substance. Amphetamine may be prescribed for attention-deficit/hyperactivity disorder, attention-deficit disorder, narcolepsy, and obesity. Amphetamine medication usually carries a warning that the drug may impair the ability to operate a vehicle or machinery, and that care should be taken until the effects of the drug are

⁸ National Institutes of Health National Library of Medicine. Seroquel. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=0584dda8-bc3c-48fe-1a90-79608f78e8a0>. Updated January 25, 2025. Accessed March 12, 2025.

⁹ Lin CY, Chiang CH, Tseng MM, Tam KW, Loh EW. Effects of quetiapine on sleep: A systematic review and meta-analysis of clinical trials. *Eur Neuropsychopharmacol*. 2023; 67:22-36. doi: 10.1016/j.euroneuro.2022.11.008.

¹⁰ Maneeton N, Maneeton B, Woottiluk P, et al. Quetiapine monotherapy in acute treatment of generalized anxiety disorder: a systematic review and meta-analysis of randomized controlled trials. *Drug Des Devel Ther*. 2016; 10:259-276. Published 2016 Jan 12. doi:10.2147/DDDT.S89485.

¹¹ Mattson ME, Albright VA, Yoon J, Council CL. Emergency department visits involving misuse and abuse of the antipsychotic quetiapine: results from the Drug Abuse Warning Network (DAWN). *Subst Abuse*. 2015; 9:39-46. doi:10.4137/SART.S22233.

¹² Kim S, Lee G, Kim E, Jung H, Chang J. Quetiapine misuse and abuse: is it an atypical paradigm of drug seeking behavior? *J Res Pharm Pract*. 2017;6(1):12-15. doi:10.4103/2279-042X.200987.

¹³ Federal Aviation Administration. Guide for aviation medical examiners: pharmaceuticals (therapeutic medications) do not issue - do not fly. Federal Aviation Administration website. https://www.faa.gov/ame_guide/media/DNI_DNF_tables.pdf. Updated June 28, 2023. Accessed March 25, 2025.

assessed after initiation of use.¹⁴ At low doses used as part of appropriate medical treatment, amphetamine may improve reaction time, cognitive function, and fatigue, but may cause people to make higher-risk choices. Amphetamine use at higher doses may cause poor impulse control and altered cognition, including inability to focus on divided attention tasks, worsened reaction time, and depressed reflexes. Amphetamine can also be used recreationally by users seeking euphoric effects, increased alertness, and relief of fatigue.¹⁵ According to the FAA, amphetamine is a “do not issue/do not fly” medication.¹³

Hydroxychloroquine, sometimes marketed as Plaquenil, is a prescription medication commonly used to treat malaria, rheumatoid arthritis, and lupus. Hydroxychloroquine was also proposed during the pandemic, for possible use in treatment or prevention of COVID-19, but studies have not demonstrated effectiveness for such use.^{16,17,18} Hydroxychloroquine typically carries a warning that use may cause potential cardiac arrhythmias, retinal toxicity, and anemia.¹⁶ According to the FAA medical case review for this accident, hydroxychloroquine is acceptable for pilot use if the underlying condition being treated is acceptable. There is guidance from the FAA for Aviation Medical Examiners issuing medical certificates to pilots using hydroxychloroquine for conditions such as arthritis. This includes a status report form to collect information from an ophthalmologist or optometrist.¹⁹

¹⁴ National Institutes of Health National Library of Medicine. Amphetamine sulfate- tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=53d40847-e0d3-48ec-81a7-ec5478553565>. Updated October 13, 2023. Accessed May 2, 2025.

¹⁵ National Highway Traffic Safety Administration (NHTSA). 2024 Drugs and Human Performance Fact Sheets. Methamphetamine (and Amphetamine). Accessed March 19, 2025. <https://rosap.ntl.bts.gov/view/dot/78924>.

¹⁶ National Institutes of Health National Library of Medicine. Hydroxychloroquine sulfate tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=452092b4-7a8f-4d19-8113-f1c2a948d3d8>. Updated June 12, 2024. Accessed March 12, 2025.

¹⁷ Magagnoli J, Narendran S, Pereira F, et al. Outcomes of Hydroxychloroquine Usage in United States Veterans Hospitalized with COVID-19. *Med*. 2020;1(1):114-127.e3. doi:10.1016/j.medj.2020.06.001.

¹⁸ Tang W, Cao Z, Han M, et al. Hydroxychloroquine in patients with mainly mild to moderate coronavirus disease 2019: open label, randomized controlled trial. *BMJ*. 2020;369:m1849. Published 2020 May 14. doi:10.1136/bmj.m1849.

¹⁹ Federal Aviation Administration. Hydroxychloroquine Status Summary. https://www.faa.gov/ame_guide/media/HydroxychloroquineChloroquineStatusReport.pdf. Updated September 25, 2024. Accessed April 16, 2025.

Tadalafil is a prescription medication commonly used to treat erectile dysfunction, symptoms of an enlarged prostate, and pulmonary hypertension.^{20,21} Tadalafil is not typically impairing, although the FAA states that pilots who use it on an as-needed basis should wait 24 hours after use before flying, and that otherwise-qualified pilots who use it daily should undergo a 7-day ground trial before flying, to monitor for side effects.²²

Acetaminophen is an over-the-counter medication commonly used to treat minor aches and pains and reduce fever.²³ Acetaminophen is not generally considered impairing.

E SUMMARY OF MEDICAL FACTS

According to the FAA medical case review, the 54-year-old male pilot's last aviation medical examination was February 20, 2022. At that time, he reported no active medical issues and no medication use. He was issued a second-class medical certificate with no limitation.

According to the pilot's autopsy report, his cause of death was multiple blunt force trauma, and his manner of death was accident. Due to the severity of his injuries, his brain was not available for examination and his heart examination was limited. Within these limitations, his autopsy did not identify significant natural disease.

Toxicological testing of muscle tissue by NMS Labs detected hydroxychloroquine at 240 ng/g and was presumptively positive for caffeine. Ethanol was not detected, at a reporting limit of 0.08 g/hg.

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem tissue specimens from the pilot. Ethanol was detected in liver tissue at 0.014 g/hg and was not detected in brain tissue. Quetiapine was detected in liver

²⁰ National Institutes of Health. National Library of Medicine. Cialis-tadalafil tablet. Film coated. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=ebddb745-81f9-4b25-8739-b2886032ed26>. Updated July 28, 2009. Accessed March 19, 2025.

²¹ National Institutes of Health. National Library of Medicine. Tadalafil tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=fceb8aaf-b4eb-4004-8ca4-f004eac6b314>. Updated January 21, 2025. Accessed March 5, 2025.

²² FAA. Guide for AMEs: Pharmaceuticals: Erectile dysfunction and benign prostatic hyperplasia. https://www.faa.gov/ame_guide/pharm/ed. Updated August 25, 2017. Accessed March 19, 2025.

²³ National Institutes of Health. National Library of Medicine. Acetaminophen tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c3b408ff-f47b-4fee-ade5-5db6e25f4ee0>. Updated June 30, 2010. Accessed March 13, 2025.

tissue and was not detected in muscle. Amphetamine was detected in liver tissue at 38 ng/g and was also detected in muscle tissue. Hydroxychloroquine, tadalafil, and acetaminophen were detected in liver and muscle tissue.

Submitted by:

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