

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



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MEDICAL

Specialist's Factual Report

September 16, 2025

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A ACCIDENT

Location: Hot Springs, Arkansas

Date: June 26, 2023

B MEDICAL SPECIALIST

Specialist JE Tuttle MD MHA FACS
National Transportation Safety Board
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 relevant regulation, medical literature, and investigator reports were also reviewed.

D FACTUAL INFORMATION

1.1 FAA Medical Case Review

According to the FAA medical case review, the 49-year-old male pilot's only aviation medical examination was March 8, 2012. At that time, reported having high blood pressure and taking lisinopril, a prescription medication commonly used to treat high blood pressure. He was issued a third-class medical certificate without limitations. The medical certificate subsequently expired. The pilot, completed a BasicMed Course, most recently in October 2022 and reported completing a BasicMed Comprehensive Medical Examination Checklist (CMEC) most recently in August 2022.¹

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/.

1.2 Autopsy

The Arkansas State Medical Examiner's Office performed the pilot's autopsy at the request of the Garland County Coroner. According to the pilot's autopsy report, his cause of death was drowning associated with multiple blunt force injuries, and his manner of death was accident. The autopsy identified coronary artery disease with 50% narrowing of the right coronary artery and less than 25% narrowing of the left anterior descending and left circumflex coronary arteries. An enlarged heart was also noted. The remainder of the autopsy, including visual examination of the heart, did not identify other significant natural disease.

1.3 Toxicology

1.3.1 Arkansas State Crime Laboratory

The Arkansas State Crime Laboratory performed toxicological testing of postmortem peripheral blood of the pilot. Cannabinoids were detected.²

1.3.2 FAA Forensic Sciences Laboratory

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem peripheral blood and urine from the pilot.³ Delta-8-tetrahydrocannabinol (delta-8-THC) was detected in peripheral blood at 6.4 ng/mL and in urine at 5.9 ng/mL. Carboxy-delta-8-THC was detected in peripheral blood at 142.7 ng/mL and in urine at 1278.5 ng/mL. 11-hydroxy-THC was detected in peripheral blood and urine. Diphenhydramine was detected in peripheral blood at 104 ng/mL and in urine at 1588 ng/mL. Fluoxetine was detected in peripheral blood at 1044 ng/mL and in urine at 827 ng/mL. Norfluoxetine was detected in peripheral blood at 1243 ng/mL and in urine at 970 ng/mL. Metoprolol and atorvastatin were detected in peripheral blood and urine. Lisinopril was detected in urine and was not detected in peripheral blood.

² According to the autopsy report, the Arkansas State Crime Laboratory tested the pilot's blood for acetone, ethanol, isopropanol, and methanol. Substances tested via immunoassay included amphetamines, barbiturates, benzodiazepines, buprenorphine, cannabinoids, cocaine metabolites, dextromethorphan, fentanyl, generic opioids, meprobamate, methadone, methamphetamines, opiates, oxycodone, tramadol, tricyclic antidepressants, and zolpidem.

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.

1.3.3 Description of Detected Substances

Delta-8-THC is a psychoactive cannabinoid chemical. Although delta-8-THC is similar to the primary psychoactive chemical in cannabis (delta-9-THC), very little delta-8-THC is present in the cannabis plant. Delta-8-THC products are often marketed as “hemp” products, which consumers may not associate with psychoactive effects. Delta-8-THC used in consumer products typically is chemically manufactured from cannabidiol (CBD), another chemical in the cannabis plant. Delta-8-THC is available in a variety of over-the-counter products for oral consumption, smoking, and inhalation. Delta-8-THC has psychoactive and intoxicating effects that can impair motor coordination, reaction time, decision making, problem solving, and vigilance.^{4,5} The potency and purity of delta-8-THC varies widely in consumer products. Delta-8 THC products have not been evaluated or approved by the FDA for safe use in any context.^{6,7} Carboxy-delta-8-THC is a non-psychoactive metabolite of delta-8-THC. 11-hydroxy THC is a psychoactive metabolite of delta-8-THC.

Diphenhydramine is a sedating antihistamine medication widely available over the counter in multiple sleep aids and cold and allergy products. Diphenhydramine can cause cognitive and psychomotor slowing and drowsiness, and often carries a warning about driving and operating machinery.^{8,9,10} In one driving simulator study, a single dose of diphenhydramine impaired driving ability more than a blood alcohol

⁴ Testai FD, Gorelick PB, Aparicio HJ, et al. Use of Marijuana: Effect on Brain Health: A Scientific Statement from the American Heart Association. *Stroke*. . 2022;53(4):e176-e187. doi:10.1161/STR.0000000000000396, 10.1161/STR.0000000000000396.

⁵ Wurz GT, Montoya E, DeGregorio MW. Examining impairment and kinetic patterns associated with recent use of hemp-derived Δ 8-tetrahydrocannabinol: case studies. *Journal of Cannabis Research*. 2022;4(1). doi:<https://doi.org/10.1186/s42238-022-00146>.

⁶ US Federal Drug Administration: 5 Things to Know about Delta-8 Tetrahydrocannabinol – Delta-8 THC. FDA. 5 Things to Know about Delta-8 Tetrahydrocannabinol – Delta-8 THC . Updated May 4, 2022. Accessed September 11, 2025.

⁷ Leas EC. The Hemp Loophole: A Need to Clarify the Legality of Delta-8-THC and Other Hemp-Derived Tetrahydrocannabinol Compounds. *Am J of Pub Health*. 2021;111(11):1927-1931. doi:<https://doi.org/10.2105/ajph.2021.306499>.

⁸ National Institutes of Health National Library of Medicine. Benadryl Allergy Liqui-Gels. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=bfeae100-e2d1-4607-be3b-2d9b15cd4f7f>. Updated November 8, 2024. Accessed September 16, 2025.

⁹ Couper F, Huestis M, Fulford J, et al. *Drugs and Human Performance Fact Sheets: 2024*. National Highway Traffic Safety Administration. DOT HS 813 650. December 2024 (Revised). <https://rosap.ntl.bts.gov/view/dot/78924>. Accessed September 16, 2025.

¹⁰ 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 September 16, 2025.

level of 0.1 g/dL.¹¹ The FAA states that pilots should not fly within 60 hours of using diphenhydramine, to allow time for it to be cleared from circulation.^{12,13} The therapeutic range of diphenhydramine in the plasma of living persons is about 25 ng/mL to 100 ng/mL. The blood to plasma ratio for diphenhydramine is reported to be 0.7 to 0.8.¹⁴ One small study of healthy adult males estimated that drowsiness may occur at plasma diphenhydramine concentrations above about 30-40 ng/mL, and mental impairment may occur at plasma diphenhydramine concentrations above about 60 ng/mL.^{9,15} Comparing diphenhydramine concentrations in postmortem blood to established ranges in living individuals must be done cautiously, because diphenhydramine has significant potential for postmortem redistribution.^{14,16} Peripheral blood specimens generally are assumed to be less susceptible to postmortem drug redistribution effects than are central blood specimens.^{17,18}

Fluoxetine is a prescription selective serotonin reuptake inhibitor (SSRI) antidepressant medication that may be used for treating depression, panic disorders, and bipolar disorders.¹⁹ Fluoxetine often carries a warning that use may increase the risk for impairment in judgement, thinking and motor skills. Users of fluoxetine should be cautioned about operating heavy machinery until they are reasonably certain of how the medication affects them.²⁰ The FAA considers fluoxetine, used as a single

¹¹ Weiler JM, Bloomfield JR, Woodworth GG, et al. Effects of fexofenadine, diphenhydramine, and alcohol on driving performance: a randomized, placebo-controlled trial in the Iowa Driving Simulator. *Ann Intern Med*. 2000;132(5):354-363. doi:10.7326/0003-4819-132-5-200003070-00004.

¹² 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/pharm/dni_dnf. Updated July 10, 2023. Accessed September 16, 2025.

¹³ Federal Aviation Administration. Allergy - antihistamine & immunotherapy medication. Guide for Aviation Medical Examiners. https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/media/AllergyAntihistamineImmunotherapyMedication.pdf. Updated October 26, 2022. Accessed September 16, 2025.

¹⁴ Baselt RC. *Disposition of Toxic Drugs and Chemicals in Man*. 11th ed. Biomedical Publications; 2017.

¹⁵ Gengo F, Gabos C, Miller JK. The pharmacodynamics of diphenhydramine-induced drowsiness and changes in mental performance. *Clin Pharmacol Ther*. 1989;45(1):15-21. doi:10.1038/clpt.1989.3.

¹⁶ Han E, Kim E, Hong H, et al. Evaluation of postmortem redistribution phenomena for commonly encountered drugs. *Forensic Sci Int*. 2012;219(1-3):265-271. doi:10.1016/j.forsciint.2012.01.016.

¹⁷ Zilg B, Thelander G, Giebe B, Druid H. Postmortem blood sampling-Comparison of drug concentrations at different sample sites. *Forensic Sci Int*. 2017;278:296-303. doi:10.1016/j.forsciint.2017.07.006.

¹⁸ Cook DS, Braithwaite RA, Hale KA. Estimating antemortem drug concentrations from postmortem blood samples: the influence of postmortem redistribution. *J Clin Pathol*. 2000;53(4):282-5. doi:10.1136/jcp.53.4.282.

¹⁹ National Institutes of Health. National Library of Medicine. Fluoxetine capsule. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=9de65da4-73f8-4c88-8198-c92e63224ddb>. Updated February 27, 2025. Accessed September 11, 2025.

²⁰ National Institutes of Health. National Library of Medicine. Fluoxetine capsule. DailyMed.

agent, to be conditionally acceptable for medical certification by Special Issuance if the pilot is otherwise qualified, subject to case-by-case evaluation of the underlying condition and its treatment. Norfluoxetine is a metabolite of fluoxetine.²¹

Metoprolol is a prescription medication commonly used as part of a treatment regime to treat high blood pressure, certain types of cardiac arrhythmias and certain types of heart failure.²² Atorvastatin is a prescription medication commonly used to treat high cholesterol. Lisinopril is a prescription medication commonly used to treat high blood pressure.^{23,24} Metoprolol, atorvastatin and lisinopril are generally not considered impairing.

2.0 Summary of Medical Facts

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<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=9de65da4-73f8-4c88-8198-c92e63224ddb>. Updated February 27, 2025. Accessed September 11, 2025.

²¹ FAA Guide for Medical Examiners. Decision Considerations- aerospace medical dispositions Item 47. Psychiatric Conditions-Use of Antidepressant Medications. https://www.faa.gov/ame_guide/app_process/exam_tech/item47/amd/antidepressants. Updated April 24, 2024. Accessed September 11, 2025.

²² National Institutes of Health. National Library of Medicine. Metoprolol succinate capsule, extended release. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=90aa06a3-100f-4466-b950-506303707b01>. Updated February 7, 2018. Accessed September 11, 2025.

²³ National Institutes of Health. National Library of Medicine. Atorvastatin calcium tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=25c8f92f-9cb6-482b-82e1-16ad7c94e7b3>. Updated September 28, 2024. Accessed September 11, 2025.

²⁴ National Institutes of Health. National Library of Medicine. Lisinopril tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=8f20acd7-2635-4a9b-b732-2a84ea93dea7>. Updated November 3, 2021. Accessed September 11, 2025.

arteries. An enlarged heart was also noted. The remainder of the autopsy, including visual examination of the heart, did not identify other significant natural disease.

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Submitted by:

JE Tuttle MD MHA FACS
Medical Officer