

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

August 20, 2024

A. CASE

NTSB ID: CEN23FA016
Location: Chandler, Texas
Date: October 21, 2022

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

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

2.0 Summary of Medical Facts

According to the FAA medical case review, the 79-year-old male pilot's last aviation medical examination was on August 12, 1999. He was issued a third-class medical certificate by Special Issuance, limited by a requirement to have available glasses for near vision, and valid for 24 months following the month examined. The

pilot's most recent Authorization for Special Issuance was dated November 2000 and was valid through August 2001, for a history of angina, angioplasty, and hypertension controlled with medication. The pilot's first Authorization for Special Issuance was dated February 1995. The pilot did not hold active FAA medical certification at the time of the accident.¹

American Forensics performed the pilot's autopsy by authorization of a Henderson County, Texas, Justice of the Peace. According to the pilot's autopsy report, his cause of death was extensive blunt force trauma and his manner of death was accident. The extent of his injuries severely limited the autopsy evaluation for natural disease; the heart and brain were not available for examination, and detailed structural evaluation of the lungs was not possible.

At the request of American Forensics, NMS Labs performed postmortem toxicological testing of blood collected from the pilot's body bag. According to the autopsy report, ethanol was detected at 0.054 g/dL. Hydrocodone was detected at 28 ng/mL, dihydrocodeine at 5.8 ng/mL, and hydromorphone at 2 ng/mL.

The FAA Forensic Sciences Laboratory also performed toxicological testing of postmortem specimens from the pilot.² Ethanol was detected at 0.022 g/dL in blood, at 0.049 g/hg in kidney tissue, and 0.075 g/hg in muscle tissue.³ Hydrocodone was detected at 21 ng/mL in blood and 303 ng/g in liver tissue. Dihydrocodeine was detected at 4 ng/mL in blood and 46 ng/g in liver tissue. Hydromorphone was detected at 1 ng/mL in blood and 3 ng/g in liver tissue. Citalopram was detected at 4188 ng/g in lung tissue and was also detected in blood. N-desmethycitalopram was detected at 945 ng/g in lung tissue and was also detected in blood. Zolpidem was detected at 5 ng/mL in blood and was also detected in liver tissue. Gabapentin was detected at 19,486 ng/mL in blood and 20,772 ng/g in liver tissue. Amitriptyline was detected at 20 ng/mL in blood and was also detected in liver tissue. Nortriptyline, glipizide, atorvastatin, valsartan, carvedilol, and clopidogrel were detected in blood and liver tissue. Tamsulosin was detected in liver tissue but not blood. Sildenafil was detected in blood but not liver tissue. The blood used for FAA testing was collected from the pilot's body bag and was unsuitable for carboxyhemoglobin testing.

¹ FAA medical certification is not required for a pilot to exercise sport pilot privileges in a light sport aircraft if other required qualifications and operating restrictions are met ([14 CFR Part 61 Subpart J](#)). Prohibitions on operations during medical deficiency ([14 CFR 61.53](#)) and while using drugs that affect faculties in a way contrary to safety ([14 CFR 91.17\(a\)\(3\)](#)) apply.

² 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.

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

Ethanol is the intoxicating alcohol in beer, wine, and liquor, and, if consumed, can impair judgment, psychomotor performance, cognition, and vigilance.⁴ FAA regulation imposes strict limits on flying after consuming ethanol, including a prohibition on piloting a civil aircraft while having a blood ethanol level of 0.04 g/dL or greater.⁵ 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.^{6,7}

Hydrocodone is a prescription opioid medication that can be used to treat pain and suppress cough.^{8,9} Hydromorphone and dihydrocodeine are metabolites of hydrocodone and are also available as prescription opioid medications.^{10,11} It typically carries a warning that it may impair mental or physical abilities needed to perform potentially hazardous activities such as operating a motor vehicle, and that users should be warned not to engage in such activities unless they are tolerant to the effects of the medication and know how they will react to it.

Citalopram is a prescription medication commonly used to treat depression.¹² Major depression can cause cognitive impairment, particularly of executive function.¹³

⁴ Cook CCH. Alcohol and aviation. *Addiction*. 1997;92(5):539-555.

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

⁶ 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.

⁷ 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.

⁸ National Institutes of Health National Library of Medicine. Hydrocodone bitartrate. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=f7b55d14-0980-b680-8ceb-7489ff65455e>. Updated January 1, 2024. Accessed August 20, 2024.

⁹ National Institutes of Health National Library of Medicine. Hydrocodone polistirex and chlorpheniramine polistirex extended-release. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=25f400d9-1d6e-4d38-8f0d-98d471eba73b>. Updated May 31, 2021. Accessed August 20, 2024.

¹⁰ National Institutes of Health National Library of Medicine. Dilaudid. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=9eebd88a-5632-460f-b7b6-26c8a180540d>. Updated January 1, 2024. Accessed August 20, 2024.

¹¹ National Institutes of Health National Library of Medicine. Trezix. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=45c3c2a1-6a89-471e-b6d4-5a4cd73b987a>. Updated May 2, 2022. Accessed August 20, 2024.

¹² National Institutes of Health National Library of Medicine. Celexa. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=4259d9b1-de34-43a4-85a8-41dd214e9177>. Updated October 9, 2023. Accessed August 20, 2024.

¹³ Snyder HR. Major depressive disorder is associated with broad impairments on neuropsychological measures of executive function: a meta-analysis and review. *Psychol Bull*. 2013;139(1):81-132. doi:10.1037/a0028727.

By contrast, studies of citalopram have not established that it causes cognitive or psychomotor impairment.^{14,15} However, citalopram carries a warning that any psychoactive drug may impair judgment, thinking, or motor skills, and that users should be cautioned about operating hazardous machinery, including motor vehicles, until they are reasonably certain that citalopram does not affect their ability to engage in such activities.¹² N-desmethylocitalopram is a metabolite of citalopram.

Zolpidem is a prescription central nervous system depressant used for the short-term treatment of insomnia.¹⁶ It typically carries a warning to motor vehicle operators that it may cause drowsiness, prolonged reaction time, dizziness, sleepiness, blurred vision, and reduced alertness; also, that it may cause next-day psychomotor impairment.

Gabapentin is a prescription medication that can be used to treat nerve pain, certain types of seizures, restless legs syndrome, and other conditions.¹⁷ Gabapentin may cause sedation and dizziness and can impair coordination and performance of tasks such as operating motor vehicles and heavy machinery.¹⁸ The drug typically carries a warning that users may not be able to accurately assess how sleepy or impaired it makes them, and that they should not operate motor vehicles or complex machinery until they have gained enough experience to determine whether the drug impairs their ability to do so.

Amitriptyline is a tricyclic antidepressant medication that can be used to treat nerve pain or depression.¹⁹ Nortriptyline is an active metabolite of amitriptyline and is also a prescription medication with similar uses as amitriptyline.²⁰ Amitriptyline and

¹⁴ Fairweather DB, Pozzo CD, Kerr JS, Lafferty SV, Hindmarch I. Citalopram compared to dothiepin and placebo: effects on cognitive function and psychomotor performance. *Hum Psychopharmacol*. 1997;12(2):119-126.

¹⁵ Paul MA, Gray QW, Love RJ, Lange M. SSRI effects on psychomotor performance: assessment of citalopram and escitalopram on normal subjects. *Aviat Space Environ Med*. 2007;78(7):693-697.

¹⁶ National Institutes of Health National Library of Medicine. Zolpidem tartrate. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=2f1a3600-9bd6-3651-3ab5-1e4e0b0a3916>. Updated May 10, 2023. Accessed August 20, 2024.

¹⁷ National Institutes of Health National Library of Medicine. Neurontin. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=ee9ad9ed-6d9f-4ee1-9d7f-cfad438df388>. Updated July 12, 2022. Accessed August 20, 2024.

¹⁸ Peterson BL. Prevalence of gabapentin in impaired driving cases in Washington State in 2003-2007. *J Anal Toxicol*. 2009;33(8):545-549. doi:10.1093/jat/33.8.545.

¹⁹ National Institutes of Health National Library of Medicine. Amitriptyline hydrochloride. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=3d113e43-c694-427f-8b77-66be36a82374>. Updated September 16, 2022. Accessed August 20, 2024.

²⁰ National Institutes of Health National Library of Medicine. Pamelor. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=e17dc299-f52d-414d-ab6e-e809bd6f8acb>. Updated May 9, 2024. Accessed August 20, 2024.

nortriptyline often carry warnings that they may impair mental and/or physical abilities required for performance of hazardous tasks, such as operating machinery or motor vehicles.

Glipizide is a prescription oral medication used to help control blood sugar in diabetes.²¹ Atorvastatin is a prescription medication that can help control cholesterol and lower cardiovascular risk.²² Valsartan and carvedilol are prescription medications of different classes that may be used to treat high blood pressure and heart failure.^{23,24} Clopidogrel is a prescription antiplatelet medication that can be used to reduce cardiovascular risk in certain medical conditions, including ischemic heart disease, coronary artery stenting, recent stroke or heart attack, and peripheral arterial disease.²⁵ Tamsulosin is a prescription medication commonly used to treat symptoms of an enlarged prostate.²⁶ Tamsulosin may also be used in the treatment of kidney stones. 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.^{27,28} Glipizide, atorvastatin, valsartan, carvedilol, clopidogrel, tamsulosin, and sildenafil are not generally considered impairing (although some impairing side effects are possible).

²¹ National Institutes of Health National Library of Medicine. Glucotrol XL. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=eed99b60-d043-4249-9b2a-f05e46fb588d>. Updated June 10, 2024. Accessed August 20, 2024.

²² National Institutes of Health National Library of Medicine. Lipitor. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c6e131fe-e7df-4876-83f7-9156fc4e8228>. Updated December 1, 2022. Accessed August 20, 2024.

²³ National Institutes of Health National Library of Medicine. Diovan. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=5ddba454-f3e6-43c2-a7a6-58365d297213>. Updated July 22, 2024. Accessed August 20, 2024.

²⁴ National Institutes of Health National Library of Medicine. Coreg. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=07c619c6-4a0c-445e-94fa-664a54f68a39>. Updated November 21, 2023. Accessed August 20, 2024.

²⁵ National Institutes of Health National Library of Medicine. Clopidogrel bisulfate. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=31b4efbd-346e-454a-bebb-3e8a81bd04dd>. Updated December 7, 2022. Accessed August 20, 2024.

²⁶ National Institutes of Health National Library of Medicine. Flomax. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6771ad8e-ac92-4aec-b484-5d8350a353f8>. Updated November 7, 2023. Accessed August 20, 2024.

²⁷ National Institutes of Health National Library of Medicine. Viagra. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=0b0be196-0c62-461c-94f4-9a35339b4501>. Updated December 15, 2017. Accessed August 20, 2024.

²⁸ National Institutes of Health National Library of Medicine. Revatio. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=0b0be196-0c62-461c-94f4-9a35339b4501>. Updated January 27, 2023. Accessed August 20, 2024.

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