

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

May 14, 2024

A. CASE

NTSB ID: CEN23FA057
Location: Cleburne, Texas
Date: December 4, 2022

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 and copilot 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
- Personal medical records - copilot
- Autopsy report - copilot
- Toxicology report -copilot

2.0 Summary of Medical Facts

2.1 Pilot

According to the FAA medical case review, the 35-year-old male pilot's last aviation medical examination was January 20, 2020. At that time, he was 71 inches tall and weighed 175 pounds. He reported no active medical issues or medication use. The pilot was issued a second-class medical certificate without limitation.

The Office of the Chief Medical Examiner (OCME), Tarrant County Medical Examiner's District, performed the pilot's autopsy. According to the autopsy report, the pilot's cause of death was blunt force injuries. The manner of death was accident. Due to the extent of injuries the brain was unavailable for examination and examination of heart and lungs was limited. Within these limitations, the autopsy did not identify evidence of significant natural disease.

The OCME performed toxicological testing of postmortem muscle of the pilot. No tested-for substances were detected.¹

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem tissue specimens of the pilot.² No tested-for substances were detected.

2.2 Copilot

According to the FAA medical case review, the 30-year-old female copilot's last medical examination was May 10, 2022. At that time, she was 68 inches tall and weighed 150 lbs. She reported a history of lower back pain and no medication use. She was issued a first-class medical certificate without limitations.

Personal medical records were reviewed from the copilot's primary care physicians for 3 years before the crash date. There was visit on May 31, 2022, to establish care with a new primary care practice. The visit note indicated that the copilot had no home medications. None of the reviewed primary care records contained any mention of quetiapine or any condition necessitating its use.

The OCME, Tarrant County Medical Examiner's District, performed the copilot's autopsy. According to the autopsy report, the copilot's cause of death was blunt force injuries. The manner of death was accident. Autopsy evaluation for natural

¹ The toxicology report listed tested-for drugs/drug classes as: ethanol, amphetamine, methamphetamine, benzodiazepines, cocaine, opiates, cannabinoids, oxycodone, and fentanyl(s).

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.

disease was limited by the extent of injuries. The brain was unavailable for examination. Within these limitations, the autopsy did not identify evidence of significant natural disease.

The OCME performed postmortem toxicological testing of cavity blood of the copilot. Diphenhydramine was detected at 58 ng/mL. No other tested-for substances were detected.¹

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem cavity blood, muscle, and liver tissue of the copilot.² Quetiapine was detected in liver tissue at 17 ng/g but not in blood. Hydroxyzine was detected in liver tissue at 6 ng/g but not in blood. Diphenhydramine was detected in liver tissue at 17 ng/g and cavity blood at 57 ng/mL. Dextromethorphan and dextrophan were detected in liver tissue and cavity blood.

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. Quetiapine is also FDA-approved for treating acute episodes of mania and depression in bipolar disorder, and as part of chronic multi-drug treatment of bipolar disorder. Additionally, quetiapine is approved as part of multi-drug treatment of major depressive disorder. Quetiapine is regularly prescribed for off-label (non-FDA-approved) uses, including, in low doses, treatment of insomnia without an underlying psychiatric illness. Some other possible off-label uses include chronic single-drug treatment of bipolar disorder, as well treatment of post-traumatic stress disorder and anxiety.³⁻⁹ Quetiapine may also be

³ 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 27, 2022. Accessed April 25, 2024.

⁴ Stovall J. Bipolar mania and hypomania in adults: choosing pharmacotherapy. In: Post TW, ed. *UpToDate*. Waltham, MA: UpToDate Inc. <https://www.uptodate.com/contents/bipolar-mania-and-hypomania-in-adults-choosing-pharmacotherapy>. Updated July 29, 2022. Accessed April 25, 2024.

⁵ Shelton RC, Bobo WV. Bipolar major depression in adults: choosing treatment. In: Post TW, ed. *UpToDate*. Waltham, MA: UpToDate Inc. <https://www.uptodate.com/contents/bipolar-major-depression-in-adults-choosing-treatment>. Updated May 19, 2022. Accessed April 25, 2024.

⁶ Post RM. Bipolar disorder in adults: choosing maintenance treatment. In: Post TW, ed. *UpToDate*. Waltham, MA: UpToDate Inc. <https://www.uptodate.com/contents/bipolar-disorder-in-adults-choosing-maintenance-treatment>. Updated April 19, 2023. Accessed April 25, 2024.

⁷ Thase ME. Quetiapine monotherapy for bipolar depression. *Neuropsychiatr Dis Treat*. 2008;4(1):11-21.

⁸ Neubauer DN. Pharmacotherapy for insomnia in adults. In: Post TW, ed. *UpToDate*. Waltham, MA: UpToDate Inc. <https://www.uptodate.com/contents/pharmacotherapy-for-insomnia-in-adults>. Updated May 24, 2023. Accessed April 25, 2024.

⁹ Modesto-Lowe V, Harabasz AK, Walker SA. Quetiapine for primary insomnia: consider the risks. *Cleve Clin J Med*. 2021;88(5):286-294. doi:10.3949/ccjm.88a.20031.

misused or abused, often in combination with other recreational substances.^{9- 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 it 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.¹³ The FAA considers quetiapine to be a “Do Not Issue/Do Not Fly” medication.¹⁴ According to the FAA medical case review for this accident, quetiapine is unacceptable for FAA medical certification.

Hydroxyzine is a prescription medication that can be used to treat anxiety, as well as pruritis (itching) due to allergies. Hydroxyzine usually carries a warning that users may experience drowsiness and should use caution when driving a motor vehicle or operating machinery.^{15, 16} Caution is advised in using hydroxyzine and diphenhydramine at the same time as severe adverse drug reactions can occur. These include severe cardiac rhythm abnormalities, increased drowsiness, dry mouth, and confusion.¹⁷ The FAA states that anti-anxiety medications are “Do Not Issue/Do

¹⁰ 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.

¹¹ 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.

¹² Klein L, Bangh S, Cole JB. Intentional recreational abuse of quetiapine compared to other second-generation antipsychotics. *West J Emerg Med*. 2017;18(2):243-250. doi:10.5811/westjem.2016.10.32322.

¹³ Jibson MD. Second-generation antipsychotic medications: pharmacology, administration, and side effects. In: Post TW, ed. *UpToDate*. Waltham, MA: UpToDate Inc. <https://www.uptodate.com/contents/second-generation-antipsychotic-medications-pharmacology-administration-and-side-effects>. Updated May 9, 2023. Accessed April 25, 2024.

¹⁴ Federal Aviation Administration. Do Not Issue Medications/Do Not Fly Medications. https://www.faa.gov/ame_guide/media/DNI_DNF_tables.pdf. Updated June 28, 2023. Accessed June 25, 2024.

¹⁵ National Institutes of Health National Library of Medicine. Hydroxyzine hydrochloride tablet. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=878b7e81-d904-457b-91bd-47129816cc60>. Updated February 28, 2024. Accessed April 25, 2024.

¹⁶ McIntyre IM, Mallett P, Trochta A, Morhaime J. Hydroxyzine distribution in postmortem cases and potential for redistribution. *Forensic Sci Int*. 2013;231(1-3):28-33. doi:10.1016/j.forsciint.2013.04.013

¹⁷ Fein MN, Fischer DA, O’Keefe AW, Sussman GL. CSACI position statement: Newer generation H1-antihistamines are safer than first-generation H1-antihistamines and should be the first-line antihistamines for the treatment of allergic rhinitis and urticaria. *Allergy Asthma Clin Immunol*. 2019;15(1). doi:10.1186/s13223-019-0375-9.

Not Fly” medications both for their sedating effects and the potentially underlying conditions being treated.¹⁸

Diphenhydramine is a sedating antihistamine medication widely available over the counter in multiple sleep aids and cold and allergy products. Diphenhydramine can cause drowsiness, decrease reaction time, and impair attention and memory. It often carries a warning that caution should be taken when performing tasks such as driving and operating machinery.^{19,20} The FAA states that pilots should not fly within 60 hours of using diphenhydramine, to allow time for it to be cleared from circulation.²¹

Dextromethorphan is an over-the-counter cough suppressant found in numerous common cough syrups and cold medications.²² Dextromethorphan is not typically impairing at levels associated with medicinal use. The FAA states that pilots should not fly after using dextromethorphan until at least five dosage intervals have elapsed, to allow time for the drug to be cleared from circulation.²³ Dextrophan is a metabolite of dextromethorphan.

Submitted by:

JE Tuttle MD MHA FACS
Medical Officer

¹⁸ Federal Aviation Administration, Guide for Aviation Medical Examiners. Pharmaceuticals. Do Not Issue- Do Not Fly. https://www.faa.gov/ame_guide/media/DNI_DNF_tables.pdf. Updated June 28, 2023. Accessed April 25, 2024.

¹⁹ National Institutes of Health National Library of Medicine. Benadryl-diphenhydramine hydrochloride tablet. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=702f9786-7ce9-43e4-921d-e1db09612127>. DailyMed. Updated January 29, 2024. Accessed April 9, 2024.

²⁰ Couper FJ, Logan BK. Drugs and Human Performance Fact Sheets. National Highway Traffic Safety Administration. DOT HS 809 725. April 2014 (Revised). <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf>. Accessed April 9, 2024.

²¹ 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 April 9, 2024.

²² National Institutes of Health National Library of Medicine. Acetaminophen, dextromethorphan, phenylephrine. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=563452d1-0c19-4094-895a-805c859bc49b>. Updated January 15, 2015. Accessed May 13, 2024.

²³ Federal Aviation Administration. What over-the-counter medications can I take and still be safe to fly? https://www.faa.gov/sites/aa.gov/files/licenses_certificates/medical_certification/medications/OTCMedicationsforPilots.pdf. Updated November 13, 2019. Accessed May 13, 2024.