

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

January 17, 2024

A. CASE

NTSB ID: CEN22FA151
Location: Rowlett, Texas
Date: March 25, 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 CFI and pilot under instruction 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 - certified flight instructor (CFI)
- Toxicology report - CFI
- Autopsy report - pilot under instruction
- Toxicology report - pilot under instruction

2.0 Summary of Medical Facts

2.1 CFI

The 31-year-old female CFI's last aviation medical examination was June 8, 2021. At that time, she reported no medication use and no active medical conditions. She was issued a second-class medical certificate without limitation.

The Southwestern Institute of Forensic Sciences at Dallas Office of the Medical Examiner, Dallas, Texas, performed the CFI's autopsy. According to the CFI's autopsy report, her cause of death was blunt force injuries and her manner of death was accident. Her autopsy did not identify significant natural disease.

Postmortem toxicology testing of the CFI was performed by the Southwestern Institute of Forensic Sciences at Dallas and by the FAA Forensic Sciences Laboratory. Both laboratories detected the prescription antidepressant medication bupropion and its metabolite hydroxybupropion in cavity blood and urine specimens.

Bupropion is a prescription medication that acts on the central nervous system (CNS) and can be used to treat depression and to help people quit smoking.^{1,2} Hydroxybupropion is a metabolite of bupropion. Bupropion's mechanism of action and side-effect profile differs from other antidepressants; it does not typically cause sedation but may cause insomnia, and may increase susceptibility to seizures.^{1,3} One small study of healthy subjects found no significant impact of sustained-release bupropion on psychomotor performance, including on tests intended to simulate flying performance.⁴ In patients with major depression, bupropion may improve associated neurocognitive deficits.⁵ Research on motor vehicle crash risk indicates that depression, antidepressants, or the combination of depression and antidepressants may present a safety hazard, but the independent contributions of

¹ National Institutes of Health National Library of Medicine. Wellbutrin XL. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=a435da9d-f6e8-4ddc-897d-8cd2bf777b21>. Updated March 4, 2022. Accessed October 24, 2023.

² National Institutes of Health National Library of Medicine. Wellbutrin SR. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=cbc8c074-f080-4489-a5ae-207b5fadeba3>. Updated December 6, 2022. Accessed October 24, 2023.

³ Stahl SM, Pradko JF, Haight BR, Modell JG, Rockett CB, Learned-Coughlin S. A review of the neuropharmacology of bupropion, a dual norepinephrine and dopamine reuptake inhibitor. *Prim Care Companion J Clin Psychiatry*. 2004;6(4):159-166. doi:10.4088/pcc.v06n0403.

⁴ Paul MA, Gray G, Kenny G, Lange M. The impact of bupropion on psychomotor performance. *Aviat Space Environ Med*. 2002;73(11):1094-1099.

⁵ Gualtieri CT, Johnson LG. Bupropion normalizes cognitive performance in patients with depression. *MedGenMed*. 2007;9(1):22.

antidepressants to that hazard generally are not well-defined.⁶ Typically, bupropion carries a warning that any drug that acts on the CNS may impair users' ability to perform tasks requiring judgment or motor and cognitive skills, and that bupropion users should not drive or operate hazardous machinery until they are reasonably certain that the drug does not adversely affect their performance.^{1,2} According to the FAA medical case review for this crash, bupropion was considered disqualifying for pilot medical certification. In May 2023, the FAA added extended-release and sustained-release (but not immediate-release) formulations of bupropion to the list of antidepressants that may be considered for FAA medical certification via special issuance.⁷

2.2 Pilot under instruction

The 42-year-old male pilot under instruction's last aviation medical examination was December 7, 2018. At that time, he reported no medication use and no active medical conditions. He was issued a third-class medical certificate limited by a requirement to wear corrective lenses.

The Southwestern Institute of Forensic Sciences at Dallas Office of the Medical Examiner, Dallas, Texas, performed the pilot under instruction's autopsy. According to the pilot under instruction's autopsy report, his cause of death was blunt force injuries and his manner of death was accident. His autopsy did not identify significant natural disease. Thermal injury was present, without airway soot.

Postmortem toxicology testing of the pilot under instruction was performed by the Southwestern Institute of Forensic Sciences at Dallas. This testing detected pseudoephedrine and measured carboxyhemoglobin at 10% in cavity blood. Postmortem toxicology testing of the pilot under instruction also was performed by the FAA Forensic Sciences Laboratory. This testing detected cetirizine in cavity blood and liver tissue, and did not detect carboxyhemoglobin in cavity blood at a reporting threshold of 10%.

Carboxyhemoglobin is formed when carbon monoxide binds to hemoglobin in blood. Carbon monoxide is an odorless, tasteless, colorless, nonirritating gas that can be produced during hydrocarbon combustion. Nonsmokers normally have

⁶ Hill LL, Lauzon VL, Winbrock EL, Li G, Chihuri S, Lee KC. Depression, antidepressants and driving safety. *Inj Epidemiol.* 2017;4(1):10. doi:10.1186/s40621-017-0107-x.

⁷ Federal Aviation Administration. Guide for aviation medical examiners: decision considerations - aerospace medical dispositions, item 47, psychiatric conditions - use of antidepressant medications. Federal Aviation Administration website. https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/app_process/exam_tech/item47/amd/antidepressants. Updated June 28, 2023. Accessed October 24, 2023.

carboxyhemoglobin levels of less than 1-3%, while heavy smokers may have levels as high as 10-15%.⁸⁻¹²

Pseudoephedrine is a drug commonly used as a nasal decongestant; it is widely available in a variety of cold and allergy medications sold "behind the counter" with no requirement for a prescription.^{13,14} Used appropriately, pseudoephedrine is not generally considered impairing.

Cetirizine is a second-generation antihistamine medication that is available over the counter and is commonly used to treat allergy symptoms. Cetirizine typically carries a warning that users may experience drowsiness and should be careful when driving a motor vehicle or operating machinery.¹⁵ Data on sedation and psychomotor impairment from cetirizine are mixed, with some studies but not others finding some sedating and impairing effects.^{16,17,18} The FAA states that pilots should wait 48 hours

⁸ Maloney GE. Carbon monoxide. In: Tintinalli JE, Ma OJ, Yealy DM, et al., eds. *Tintinalli's Emergency Medicine: A Comprehensive Study Guide*. 9th ed. New York, NY: McGraw-Hill Education; 2020:1414-1417.

⁹ Clardy PF, Manaker S, Perry H. Carbon monoxide poisoning. In: Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <https://www.uptodate.com/contents/carbon-monoxide-poisoning>. Updated August 4, 2023. Accessed October 24, 2023.

¹⁰ Spitz WU. Asphyxia. In: Spitz WU, Spitz DJ, eds. *Spitz and Fisher's Medicolegal Investigation of Death: Guidelines for the Application of Pathology to Crime Investigation*. 4th ed. Springfield, IL: Charles C Thomas; 2006:783-845.

¹¹ Dolinak D, Matshes EW, Lew EO. Environmental injury. In: Dolinak D, Matshes EW, Lew EO, eds. *Forensic Pathology: Principles and Practice*. Burlington, MA: Elsevier Academic Press; 2005:239-258.

¹² Hampson NB, Piantadosi CA, Thom SR, Weaver LK. Practice recommendations in the diagnosis, management, and prevention of carbon monoxide poisoning. *Am J Respir Crit Care Med*. 2012;186(11):1095-1101. doi:10.1164/rccm.201207-1284CI.

¹³ National Institutes of Health National Library of Medicine. Sudafed Sinus Congestion. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c05d7e27-6821-468f-b27d-9c0b02a07b0f>. Updated March 23, 2023. Accessed October 24, 2023.

¹⁴ Food and Drug Administration. Legal requirements for the sale and purchase of drug products containing pseudoephedrine, ephedrine, and phenylpropanolamine. Food and Drug Administration website. <https://www.fda.gov/drugs/information-drug-class/legal-requirements-sale-and-purchase-drug-products-containing-pseudoephedrine-ephedrine-and>. Updated November 24, 2017. Accessed October 24, 2023.

¹⁵ 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 May 19, 2023. Accessed October 24, 2023.

¹⁶ Adelsberg BR. Sedation and performance issues in the treatment of allergic conditions. *Arch Intern Med*. 1997;157(5):494-500.

¹⁷ 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 October 24, 2023.

¹⁸ 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.

after using cetirizine before flying, to allow time for the drug to be cleared from circulation.¹⁹

Submitted by:

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Medical Officer

¹⁹ 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 October 24, 2023.