

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



WPR22FA229

MEDICAL

Specialist's Factual Report

November 8, 2022

A. ACCIDENT

Location: Kerrville, Texas
Date: June 25, 2022
Time: 18:23 Local
Airplane: Mooney M20J; N4267H

B. MEDICAL SPECIALIST

Specialist Michelle Watters, MD, PhD, MPH
National Transportation Safety Board, RE-1
Washington, DC

C. DETAILS OF THE INVESTIGATION

Purpose

This investigation was performed to evaluate the pilot for medical conditions, the use of medications/illicit drugs, and the presence of toxins.

Methods

The Federal Aviation Administration (FAA) medical case review and the pilot's autopsy and FAA Forensic Sciences Laboratory toxicology reports¹ were reviewed. Other relevant medical and regulatory issues were reviewed.

D. FACTUAL INFORMATION - PILOT

1.0 FAA Medical Case Review

According to the FAA medical case review, at the time of the accident, the 67-year-old male pilot had an expired medical certificate. His most recent and only medical certification examination was in November 2001.

2.0 Autopsy

According to the autopsy report prepared for the Kerr County Justice of the Peace, Kerrville, Texas, the pilot's cause of death was blunt trauma, thermal injuries, and inhalation products of combustion, and the manner of death was accident. The medical examiner reported that soot was found in the pilot's upper and lower airways and there were burns in the airway. The medical examiner reported the pilot had an

¹ The FAA Forensic Sciences Laboratory has the capability to test for more than 1,300 substances including toxins, common prescription and over-the-counter medications, and illicit drugs.
<https://jag.cami.jccbi.gov/toxicology/>

enlarged heart (460 grams), left ventricular hypertrophy (1.5 centimeters), moderate atherosclerosis of the left anterior descending coronary artery, and severe complex atherosclerotic aortic plaques.

3.0 Toxicology

Toxicology testing performed for Kerr County identified doxylamine at 31 nanograms per milliliter (ng/mL) in femoral blood. Amitriptyline and nortriptyline were detected at concentrations below 10 ng/mL in femoral blood. Toxicology testing performed by the FAA Forensic Sciences Laboratory identified doxylamine in the pilot's heart blood at 115 ng/mL and in his liver. Amitriptyline and nortriptyline were detected in his heart blood and liver tissue. The non-sedating cough suppressant dextromethorphan and its metabolite dextrorphan were detected in his heart blood and liver tissue.²

Doxylamine is a sedating antihistamine available over the counter to treat allergy symptoms or as a sleep aid. Its therapeutic range is 50 to 150 ng/mL, and it has a half-life of 6 to 12 hours.³ Doxylamine undergoes postmortem redistribution and central blood levels may be two to four times higher than peripheral blood levels.⁴ FAA provides guidance on wait times before flying after using this medication; post-dose observation time is 60 hours and the medication is not for daily use.^{5,6}

Amitriptyline, commonly marketed as Elavil, is a prescription medication indicated for the treatment of depression, eating disorders, and chronic nerve pain; it is known to have sedative effects. Amitriptyline carries the warning that use may impair the mental and physical ability to perform hazardous tasks. The therapeutic range of amitriptyline is 50 to 300 ng/mL. Amitriptyline has an average half-life of 30 to 50 hours; *nortriptyline*, its active metabolite, has a half-life of 18-44 hours and has a

² FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs.

Dextromethorphan. <https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=42>

Dextrophan. <https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=43>

³ FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Doxylamine.

<https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=53>

⁴ Han, E, E Kim, H Hong, S Jeong, J Kim, S In, H Chung, and S Lee. 2012 Evaluation of postmortem redistribution phenomena for commonly encountered drugs. *Forensic Sci Int.* 219(1-3):265-271.

⁵ FAA. 11/13/19. What over-the-counter (OTC) medications can I take and still be safe to fly? OK-20-0302

https://www.faa.gov/licenses_certificates/medical_certification/media/OTCMedicationsforPilots.pdf

⁶ FAA. 7/2/21. [AllergyAntihistamineImmunotherapyMedication.pdf](https://www.faa.gov/licenses_certificates/medical_certification/media/AllergyAntihistamineImmunotherapyMedication.pdf) (faa.gov)

therapeutic range of 70 to 170 ng/mL.^{7,8} Like other tricyclic antidepressants, amitriptyline and nortriptyline undergo postmortem redistribution and central levels may be two to three times higher than peripheral levels.⁹ Amitriptyline is not a medication that has been approved by FAA for treatment of depression in pilots.¹⁰

E. SUMMARY OF MEDICAL FACTS

The 67-year-old male pilot had an expired medical certificate. His most recent and only FAA medical certification examination was in November 2001. According to the autopsy report, the pilot's cause of death was blunt trauma, thermal injuries, and inhalation products of combustion, and the manner of death was accident. The medical examiner reported the pilot had soot in his upper and lower airways. He also had an enlarged heart (460 grams), left ventricular hypertrophy (1.5 centimeters), moderate atherosclerosis of the left anterior descending coronary artery, and severe complex atherosclerotic aortic plaques.

Toxicology testing detected doxylamine at 31 nanograms per milliliter (ng/mL) in femoral blood, 115 ng/mL in heart blood, and in his liver tissue. Amitriptyline and nortriptyline were detected but not quantified in his femoral blood, heart blood, and liver tissue. The non-sedating cough suppressant dextromethorphan and its metabolite dextrorphan were detected in his heart blood and liver tissue.

Submitted by:

Michelle Watters, MD, PhD, MPH
Medical Officer, RE-1

⁷ NIH. NLM. Updated 9/16/22. [DailyMed - AMITRIPTYLINE HYDROCHLORIDE tablet \(nih.gov\)](https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?id=20222)

⁸ Schulz, M, A Schmoldt, H Andresen-Streichert, and S Iwersen-Bergmann. 2020. Revisited: Therapeutic and toxic blood concentrations of more than 1100 drugs and xenobiotics. Additional File 1. *Critical Care* 24(1):195 doi: 10.1186/s13054-020-02915-5.

⁹ Han, E, E Kim, H Hong, S Jeong, J Kim, S In, H Chung, and S Lee. 2012 Evaluation of postmortem redistribution phenomena for commonly encountered drugs. *Forensic Sci Int.* 219(1-3):265-271.

¹⁰ FAA. Last modified 7/23/18. Guide for Aviation Medical Examiners, Item 47. Psychiatric Conditions - Use of Antidepressant Medications. https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/app_process/exam_tech/item47/amd/antidepressants/