



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

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A. ACCIDENT: WPR19FA109; Fort McDowell, Arizona

On April 16, 2019, about 0706 mountain standard time, a Bell 206B experimental, helicopter, N61PH, was involved in an accident near Fort McDowell, Arizona. The commercial pilot and pilot-rated passenger were fatally injured. The helicopter was operating as a Title 14 Code of Federal Regulations Part 91 local flight-test flight.

B. GROUP IDENTIFICATION

No group was formed for the medical evaluation in this accident.

C. DETAILS OF INVESTIGATION

Purpose

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

Methods

The Federal Aviation Administration (FAA) medical case review, the commercial pilot's autopsy and FAA Forensic Sciences laboratory toxicology¹ report, and the pilot-rated passenger's autopsy, FAA toxicology report, and his personal medical records were reviewed. Other pertinent scientific and regulatory issues were reviewed.

Commercial Pilot

FAA Medical Case Review

According to the FAA medical case review, the 52-year-old male commercial pilot held a second class medical certificate with the limitation that he wear corrective lenses for near and distant vision. At the time of the most recent exam (5/8/2018), the pilot reported 1,200 total hours of civil flight experience. The pilot was 70 inches tall and weighed 178 pounds. The pilot reported taking no medications and having hay fever. No significant medical issues were identified by the aviation medical examiner.

¹ See <https://jag.cami.jccbi.gov/toxicology/> for a complete list of tested-for substances.

Autopsy

According to the autopsy performed by the Maricopa County Office of the Medical Examiner, Phoenix, Arizona, the cause of death was helicopter crash and the manner of death was accident. The medical examiner reported that the pilot had extensive thermal and blunt force injuries. While the investigation was limited by the injuries, no significant natural disease was identified.

Toxicology

Toxicology testing by the medical examiner's office detected the non-sedating antihistamine loratadine (commonly marketed as Claritin) at 1,000 nanograms per gram (ng/gm), its non-sedating metabolite desloratadine at 1,600 ng/gm, and ethanol at 0.041 grams per hectogram (gm/hg) in liver tissue.^{2,3,4} The pilot's liver tissue also tested positive for the decomposition product beta-phenethylamine,⁵ caffeine, and theobromine. FAA Forensic Sciences Laboratory toxicology testing detected loratadine and desloratadine in liver and lung tissue and the sedating antihistamine pheniramine in liver tissue. The laboratory also detected ethanol in liver tissue at 0.012 gm/hg, but not in muscle tissue.

Relevant Toxicological Information

Ethanol is a social drug commonly consumed by drinking beer, wine, or liquor. It acts as a central nervous system depressant; it impairs judgment, psychomotor functioning, and vigilance. Ethanol is water soluble, and after absorption it quickly and uniformly distributes throughout the body's tissues and fluids. The distribution pattern parallels water content and blood supply of the tissue. Ethanol can be produced after death by microbial activity.⁶

Pheniramine is a common over the counter antihistamine used to relieve hay fever and cold symptoms. It carries the warning that it may impair physical or mental ability to perform potentially hazardous tasks. Pheniramine has a long elimination half-life of 8 to 19 hours and FAA recommends waiting at least 5 dosage intervals before performing airman duties.^{7,8}

Pilot-rated Passenger

FAA Medical Case Review

According to the FAA medical case review, the 28 year-old male pilot-rated passenger held a third class medical certificate with no limitations. At the time of the most recent and only exam (8/23/18), the pilot reported zero hours of civil flight experience, and was 72 inches tall and weighed 189 pounds. The pilot reported taking no medications and having no medical conditions. No significant medical issues were identified by the aviation medical examiner.

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

<https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=150>.

³ FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Desloratadine. (Note: desloratadine is a synonym for descarboethoxyloratadine.) <https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=379>.

⁴ Grams per hectogram in tissue samples are directly comparable to grams per deciliter in liquid samples.

⁵ FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Phenethylamine.

<https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=102>.

⁶ Kugelberg, FC and AW Jones. 2007. Interpreting results of ethanol analysis in postmortem specimens: a review of the literature. *Forensic Science International* 165(1):10-29.

⁷ FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Pheniramine.

<https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=103>.

⁸ 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

Autopsy

According to the autopsy performed by the Maricopa County Office of the Medical Examiner, Phoenix, Arizona, the cause of death was helicopter crash and the manner of death was accident. The medical examiner reported that the pilot had extensive thermal and blunt force injuries. No significant natural disease was identified.

Toxicology

Toxicology testing by the medical examiner's office detected amphetamine in cavity blood at 46 ng/mL. They also detected caffeine and ibuprofen in cavity blood. FAA Forensic Sciences Laboratory toxicology testing detected amphetamine in the pilot-rated passenger's urine (829 nanograms per milliliter [ng/mL]), muscle tissue (26 ng/gm), liver tissue (171 ng/gm) and lung tissue (87 ng/gm). Ibuprofen was also detected in urine.

Personal Medical Records

Primary care records were obtained for the pilot-rated passenger that covered the period one year prior to the accident. His most recent medical visit was on 2/6/19. The pilot-rated passenger had a history of migraines and traumatic brain injury subsequent to an automobile accident in 2012. His current medical conditions included seasonal allergies, gastroesophageal reflux disease, and attention deficit hyperactivity disorder (ADHD).⁹ He was prescribed Vyvanse (an amphetamine) for ADHD; the pilot-rated passenger reported feeling "well-controlled and more focused" on the medication and he was described as stable on the medication, having no suicidal thoughts, and having good insight and judgment.

Relevant Toxicological and Medical Information

Amphetamine is a prescription medication used for the treatment of ADHD, narcolepsy, and obesity. In some preparations, the prescription drug is metabolized to amphetamine; commonly marketed names include Adderall, Dexedrine, and Vyvanse. Therapeutic concentrations of amphetamine ranges from 20 to 100 ng/mL; concentrations greater than 200 ng/mL represent abuse. The half-life is between 10 to 13 hours. It is a central nervous stimulant and widely used drug of abuse. Amphetamine carries a boxed warning about its potential for abuse and drug dependence. It also carries warnings about an increased risk of sudden death and the potential for mental health and behavioral changes. At lower doses, amphetamine has few effects on cognitive functioning; risk-taking increases at higher doses.^{10,11,12}

ADHD is a mental health disorder that features inattention, impulsivity, and hyperactivity. It is also associated with impairments in motor inhibition, reaction time, visual-motor coordination, executive functioning, decision-making, and rule-governed behavior. Adolescents and young

⁹ The medical records reported the pilot-rated passenger's medical condition as ADD (attention deficit disorder), which is an older name for ADHD used especially when hyperactivity was not a prominent feature.

¹⁰ FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Amphetamine.
<https://jag.camii.jccbi.gov/toxicology/DrugDetail.asp?did=11>

¹¹ National Institutes of Health. U.S. National Library of Medicine. Updated 11/26/19. Amphetamine sulfate.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=828c84a6-a317-4e4d-9521-0c3865ff732f>.

¹² National Highway Traffic Safety Administration. April 2014. Drugs and Human Performance Fact Sheets. Methamphetamine (and Amphetamine). <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf>

adults with ADHD are 2 to 4 times more likely to have been the driver in a motor vehicle accident than peers without the illness.^{13,14} Results of a recent systematic review indicate that the use of therapeutic levels of stimulants to treat ADHD did not worsen driving performance and generally improved driving performance in ADHD patients.¹⁵

D. SUMMARY OF MEDICAL FINDINGS

Commercial Pilot

At the time of the accident, the 52-year-old male commercial pilot held a second class medical certificate with a limitation that he wear corrective lenses for near and distant vision. At his most recent medical certification exam (5/8/18), he reported no medication use and having hay fever.

According to the autopsy, the cause of death in the commercial pilot was helicopter crash and the manner of death was accident. No significant natural disease was identified. Postmortem toxicology testing detected the antihistamines pheniramine, loratadine, and desloratadine in liver tissue. Ethanol was detected in liver tissue at 0.012 gm/hg and 0.041 gm/hg, but not in muscle tissue.

Pilot-rated Passenger

At the time of the accident, the 28 year-old male pilot-rated passenger held a third class medical certificate with no limitations. He reported no medication use or medical conditions at his only medical certification exam (8/23/18).

According to the autopsy, the cause of death in the pilot-rated passenger was helicopter crash and the manner of death was accident. No significant natural disease was identified.

Postmortem toxicology testing detected amphetamine in cavity blood (46 ng/mL), urine, and muscle, liver, and lung tissues. Primary care records revealed that the pilot-rated passenger had a history of migraines and traumatic brain injury subsequent to an automobile accident in 2012. He was currently being treated for ADHD with Vyvanse, an amphetamine. On his most recent medical visit two months prior to the accident, the pilot-rated passenger was described as stable, having no suicidal thoughts, and having good insight and judgment.

¹³ Barkley, RA, KR Murphy and D Kwasnik. 1996. Motor vehicle driving performance and risks in young adults with ADHD. *Pediatrics* 98:1089-1095.

¹⁴ Aduen PA, MJ Kofler, DJ Cox, DE Sarver, and E Lunsford. 2015. Motor vehicle driving in high incidence psychiatric disability: comparison of drivers with ADHD, depression, and no known psychopathology. *Journal of Psychiatric Research* 64:59-66.

¹⁵ Gobbo MA and MR Louzã. 2014. Influence of stimulant and non-stimulant drug treatment on driving performance in patients with attention deficit hyperactivity disorder: a systematic review. *European Neuropsychopharmacology* 24(9):1425-43.