



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

April 3, 2018

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Chief Medical Officer

A. ACCIDENT: CEN17FA164; Boonville, MO

On April 24, 2017, at 1339 central daylight time, a Bellanca 17-31 airplane, N787TV, collided with high tension power lines and impacted terrain while attempting to land at the Jesse Viertel Memorial Airport (VER), Boonville, Missouri. The pilot and passenger were both fatally injured and the airplane was substantially damaged. The airplane was owned and operated by Select Airplane, LLC, under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed for the flight that operated without a flight plan.

B. GROUP IDENTIFICATION

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

C. DETAILS OF INVESTIGATION

1. Purpose

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

2. Methods

The FAA medical case review, autopsy report, toxicology findings, and the investigator's reports were reviewed.

FAA Medical Case Review

According to the FAA medical case review, the 67 year old male pilot had reported 4840 total hours of flight experience as of his last aviation medical exam, dated 2/21/2011. At that time, he was 73 inches tall, weighed 188 pounds, and reported history of migraines that ended in his twenties, hypertension, and hypothyroidism. He reported using hydrochlorothiazide to treat his hypertension and levothyroxine to treat his

thyroid condition. Neither of these medications are considered impairing. His blood pressure was 148/90. The aviation medical examiner deferred a certificate pending receipt of additional information from the pilot's treating physician. He pilot failed to provide the information and was denied a medical certificate. His previous, valid medical certificate had been issued in 1996.

Autopsy

According to the autopsy performed by the Cooper County Medical Examiner and Coroner, the cause of death was blunt force injuries and positional asphyxia.

There was significant coronary artery disease with stenosis of 60-70% in the left main, 40% in the circumflex, 60% in the left obtuse marginal and 90% in both the left anterior descending and the right coronary arteries. However, the myocardium did not show any gross evidence of previous or acute ischemia. No microscopic evaluation of the heart was performed.

There was also significant brain pathology. There was scarring from previous brain contusions in the tips of both frontal lobes and the left temporal horn. The left optic nerve was severely scarred with only a few survival axons; the neuropathologist believed this meant the pilot was nearly blind in that eye. The autopsy reports the pilot routinely wore an eye patch on the left eye; his strabismus was quite significant and the patch apparently controlled the resulting vertigo. There was a benign arachnoid cyst in the left anterior and middle fossae which was large enough to indent the surrounding brain tissue. Finally, there was acute cerebral edema sufficient to cause early herniation of the cerebellar tonsils into the foramen magnum. This was specified further as acute hypoxic/ischemic damage in the hippocampus, medial left frontal cortex, medial-inferior left temporal cortex, and bilateral entorhinal cortex. The neuropathologist commented that it would take "a few hours" for these findings to develop after the injury began.

Toxicology

Toxicology testing performed by the St. Louis University Toxicology Laboratory methamphetamine (0.16 ug/ml) and its metabolite amphetamine, cocaine and its metabolite benzoylecgonine in the pilot's blood. Cocaine (0.050 ug/ml) and benzoylecgonine were also found in vitreous.

Toxicology testing performed by the FAA's Bioaeronautical Sciences Research Laboratory identified clonazepam (0.011 ug/ml) and its active metabolite 7-aminoclonazepam (0.126 ug/ml); methamphetamine (0.22 ug/ml) and its active metabolite amphetamine (0.023 ug/ml); cocaine (0.033 ug/ml), and its three metabolites (benzoylecgonine,

anhydroecgonine methyl ester, and ecgonine methyl ester); phenylpropanolamine; paroxetine (0.464 ug/ml); diphenhydramine (0.04 ug/ml); and quinine in the pilot's blood. 7-Aminoclonazepam and ibuprofen were found in urine. Methamphetamine, amphetamine, benzoylecgonine, ecgonine methyl ester, paroxetine, and quinine were also identified in liver.

Methamphetamine is a Schedule II controlled substance and is used medically to treat ADHD, ADD and narcolepsy. Oral doses used to medically treat these illnesses typically produce blood levels in the range of 0.02-0.05 ug/ml. Those misusing the drug may reach levels of 2.0 ug/ml or higher. Symptoms of recreational methamphetamine use follow a typical pattern. In the early phase users experience euphoria, excitation, exhilaration, rapid flight of ideas, increased libido, rapid speech, motor restlessness, hallucinations, delusions, psychosis, insomnia, reduced fatigue or drowsiness, increased alertness, a heightened sense of well-being, stereotypes behavior, feelings of increased physical strength, and poor impulse control. In addition, the heart rate, blood pressure, and respiratory rate increase and users may have palpitations, dry mouth, abdominal cramps, twitching, dilated pupils, faster reaction times, and increased strength. As the initial effects wear off, users commonly experience dysphoria, restlessness, agitation, and nervousness; they may experience paranoia, violence, aggression, a lack of coordination, delusions, psychosis, and drug craving. Blood levels cannot be used to distinguish among phases of methamphetamine use.^{Error! Bookmark not defined.}

Cocaine is a strong central nervous system stimulant. Initial effects include: euphoria, excitation, general arousal, dizziness, increased focus and alertness. At higher doses, effects may include psychosis, confusion, delusions, hallucinations, fear, antisocial behavior, and aggressiveness. Late effects, beginning within 1 to 2 hours after use, include: dysphoria, depression, agitation, nervousness, drug craving, general central nervous system depression, fatigue, and insomnia. Additional performance effects are expected after higher doses, with chronic ingestion, and during drug withdrawal including agitation, anxiety, distress, inability to focus on divided attention tasks, inability to follow directions, confusion, hostility, time distortion, and poor balance and coordination.¹ There is a large overlap between therapeutic, toxic, and lethal cocaine concentrations and adverse reactions have been reported after prolonged use even with no measurable active drug in the blood.²

¹ National Highway Traffic Safety Administration Drugs and Human Performance FACT SHEETS: Cocaine <http://www.nhtsa.gov/people/injury/research/job185drugs/cocain.htm> Accessed 07/31/2015

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Clonazepam is a sedating benzodiazepine available by prescription primarily used to treat some seizures as well as anxiety and panic disorders. It is commonly marketed with the name Klonopin. It is a central nervous system depressant and carries this warning, “patients receiving this drug should be cautioned against engaging in hazardous occupations requiring mental alertness, such as operating machinery or driving a motor vehicle.”³

Phenylpropanolamine is a sympathomimetic drug used as a decongestant that is no longer available in the United States because it was shown to be associated with a significant increase in the risk of stroke. It is commonly found in street produced cocaine.

Paroxetine is a prescription antidepressant commonly marketed as Paxil. Although any psychoactive medications can be impairing, paroxetine is not known to directly cause sleepiness or other impairing symptoms. However, major depression itself is associated with significant cognitive degradation, particularly in executive functioning.⁴ As a result, the FAA requires that pilots with depression be treated and stable for a minimum of 6 months and undergo additional testing before they can receive a medical certificate.⁵

Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over the counter in a wide variety of products such as Benadryl and Unisom. Diphenhydramine carries the following FDA warning: may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery).⁶ Compared to other antihistamines, diphenhydramine causes marked sedation; it is also classed as a CNS depressant and this is the rationale for its use as a sleep aid. Altered mood and impaired cognitive and psychomotor performance may also be observed. In fact, in a driving simulator study, a single dose of diphenhydramine impaired driving ability more than a blood alcohol

³ National Institutes of Health. US National Library of Medicine. DailyMed. Clonazepam. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=acbce0e8-5098-4785-943b-8bdb5ff17fab> Accessed 4/2/2018.

⁴ Snyder H. 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.

⁵ Federal Aviation Administration, 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/ Accessed 5/24/2016.

⁶ Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Diphenhydramine. Available from: <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=50>. Accessed 03/18/2018.

concentration of 0.100%. The therapeutic range of diphenhydramine is between 0.0250 and 0.1120 ug/ml.⁷

Quinine is the active ingredient in tonic water. It is also a prescription medication used to treat malaria. It is not considered impairing.⁸

Ibuprofen is an anti-inflammatory analgesic available over the counter in a number of products such as Motrin and Advil. It is not considered sedating.

D. SUMMARY OF MEDICAL FINDINGS

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⁷ Weiler JM, B.J., Woodworth GG, Grant AR, Layton TA, Brown TL, McKenzie DR, Baker TW, Watson GS., Effects of fexofenadine, diphenhydramine, and alcohol on driving performance. A randomized, placebo-controlled trial in the Iowa Driving Simulator. Ann Intern Med 2000. 132(5): p. 354-63.

⁸ National Institutes of Health. US National Library of Medicine. DailyMed. Quinine sulfate. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=f567d5c7-ea5d-49a7-a035-b47208135f73>
Accessed 4/2/2018.

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