# NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

## Medical Factual Report

**September 6, 2018**

Mary Pat McKay, MD, MPH
Chief Medical Officer

## A. ACCIDENT: ERA17FA118; Canton, GA

On March 4, 2017 about 0023 eastern standard time, a Cessna 421B, N421KL, was substantially damaged after a collision with a powerline and terrain in Canton, Georgia. The commercial pilot was fatally injured. Night visual night meteorological conditions prevailed at the time and no flight plan was filed for the Title 14 Code of Federal Regulations (CFR) Part 91 personal flight. The flight departed from the Richard Lloyd Jones Jr Airport (RVS), Tulsa, Oklahoma at 1930 eastern standard time.

## 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 reports, toxicology findings, and the investigator's reports were reviewed.

   FAA Medical Case Review

   According to the FAA medical case review, the 69 year old male pilot reported 4,000 total hours of flight experience as of his last aviation medical exam, dated 4/13/2016. However, his previous exam had been performed in 2003, at which time he reported having 2,000 flight hours. He reported no flight hours in the 6 months preceding his last medical exam. At the time of his last exam, the pilot was 65 inches tall and weighed 173 pounds.

The pilot reported having frequent headaches, prostate problems, a corneal transplant (1982), asthma, high blood pressure, depression and anxiety that resolved in 2001, and a rotator cuff repair. His medications at the time of his last exam were reported as inhaled albuterol for his asthma (also called Ventolin or ProAir), atorvastatin and fenofibrate for his high cholesterol (also called Lipitor and TriCor respectively), and finasteride and tamsulosin to treat his prostate symptoms (also called Proscar and Flomax, respectively). These medications are not considered impairing.

Earlier records document that in 1996 and 1998 the pilot had failed to disclose depression and anxiety that reportedly occurred after the market crash of 1987 and that had required prescription medication treatment for 6 months. In 1999, he again was treated for anxiety for 3 months during a divorce. These conditions were eventually disclosed on his 2000 application. As a result of his falsification, his medical certificate was revoked by the FAA beginning 9/21/2000 for one year. He reapplied and was issued third class medical certificates in 2002 and 2003.

Because of he had asthma requiring medication, at the time of his last exam, the pilot was issued a special issuance third class medical certificate (renewed in January 2017) that was limited by a requirement to have available glasses for near vision and marked, "Not valid for any class after 04/30/2018."

Autopsy

According to the autopsy performed by Division of Forensic Sciences Georgia Bureau of Investigation, the cause of death was blunt traumatic injuries. Only a small portion of the brain was available to be examined, due to the extent of injury, which limited the evaluations. No significant natural disease was identified.

Toxicology

Toxicology testing performed by the FAA's Bioaeronautical Sciences Research Laboratory identified atorvastatin in liver and cavity blood. In addition, clonazepam and its metabolite 7-aminoclonazepam, hydrocodone and its active metabolite dihydrocodeine, diphenhydramine, nortriptyline, and temazepam were identified in liver. In addition, 0.031 ug/ml of 7-aminoclonazepam, 0.016 ug/ml of hydrocodone and an unquantified amount of dihydrocodeine, 0.129 ug/ml of diphenhydramine, and unquantified amount of nortriptyline, and 0.068 ug/ml of temazepam were identified in cavity blood.

[Clonazepam is a sedating benzodiazepine often called Klonopin that is used to treat panic disorder and certain kinds of epilepsy. It is available by

prescription as a Schedule IV substance.[1] It impairs cognitive and physical performance and carries this warning, "Since clonazepam produces central nervous system (CNS) depression, patients receiving this drug should be cautioned against engaging in hazardous occupations requiring mental alertness, such as operating machinery or driving a motor vehicle. They should also be warned about the concomitant use of alcohol or other CNS-depressant drugs during clonazepam therapy."[2]

Hydrocodone is an opioid pain medication available by prescription as a Schedule II controlled substance. Commonly available in combination with acetaminophen (commonly called Tylenol), tablets may also carry names such as Norco, Lorcet, and Vicodin. Hydrocodone "exposes users to the risks of addiction, abuse, and misuse" and "profound sedation, respiratory depression, coma, and death may result from the concomitant use of hydrocodone … with benzodiazepines or other CNS depressants (e.g., non-benzodiazepine sedatives/hypnotics, anxiolytics, tranquilizers, muscle relaxants, general anesthetics, antipsychotics, other opioids, alcohol)."[3] The range of blood levels where hydrocodone is considered to have psychoactive effects is between 0.01 and 0.05 ug/ml.[4]

Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over the counter under the names Benadryl and Unisom. Diphenhydramine carries the following warning: may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery).[5] 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

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[1] Controlled substances are those that have been identified by the Drug Enforcement Administration as having the potential for abuse and dependence. Substances are placed in their respective schedules (I-V) based on whether they have a currently accepted medical use in treatment in the United States, their relative abuse potential, and likelihood of causing dependence when abused. Schedule I substances are not legally available because of limited medical use and high risk of abuse and dependence; Schedule II substances have a high potential for abuse which may lead to severe psychological or physical dependence. As the number of the Schedule goes up, the abuse and dependence potential goes down.

[2] 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 9/5/2018.

[3] National Institutes of Health. US National Library of Medicine. DailyMed. Hydrocodone Bitartrate and Acetaminophen. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=fa32969f-7210-47ec-bbd1-f62bea8989a7 Accessed 9/5/2018.

[4] Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Hydrocodone. http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=73 Accessed 9/6/2018.

[5] 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.

more than a blood alcohol concentration of 0.100%.[6] The therapeutic range of diphenhydramine is 0.0250 to 0.1120 ug/ml.[7] Diphenhydramine is widely distributed throughout the body and brain after an oral dose. Typical blood levels within 2-3 hours after oral ingestion of 50-100 mg are about 0.100 ug/ml.[8] However, diphenhydramine undergoes post mortem redistribution where after death, the drug can leech from storage sites back into blood. Central post mortem levels may be about two to three times higher than peripheral levels.[9]

Nortriptyline is a tricyclic antidepressant, often marketed with the name Pamelor. It carries this warning about performance: "may impair the mental and/or physical abilities required for the performance of hazardous tasks, such as operating machinery or driving a car."[10]

Temazepam is a sedating benzodiazepine medication available by prescription as a Schedule IV controlled substance and often marketed with the name Restoril. It is indicated for the short-term treatment of insomnia (generally 7 to 10 days). It carries a black box warning (the strongest level) regarding prescribing in combination with opioids: "Concomitant use of benzodiazepines and opioids may result in profound sedation, respiratory depression, coma, and death." In addition, there is this precaution, "If temazepam is to be combined with other drugs having known hypnotic properties or CNS-depressant effects, consideration should be given to potential additive effects." Finally, there are warnings about the potential for bizarre behaviors and "there have been reports of people getting out of bed after taking a sedative-hypnotic and driving their cars while not fully awake, often with no memory of the event. If a patient experiences such an episode, it should be reported to his or her doctor immediately, since "sleep-driving" can be dangerous. This behavior is more likely to occur when temazepam is taken with alcohol or other central nervous system depressants."[11] The range of blood levels where

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[6] 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.
[7] Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Diphenhydramine. Available from: http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=50. Accessed 03/13/2018.
[8] National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf Accessed 03/13/2018.
[9] Han E, Kim E, Hong H, Jeong S, Kim J, In S, Chung H, Lee S. Evaluation of postmortem redistribution phenomena for commonly encountered drugs. Forensic Sci Int. 2012;219(1-3):265-71.
[10] National Institutes of Health. US National Library of Medicine. DailyMed. Nortriptyline. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=765d726b-fd4b-4ef7-afd7-9e7e9bf8cae6 Accessed 9/5/2018.
[11] National Institutes of Health. US National Library of Medicine. DailyMed. Temazepam. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=a4370eb4-b00d-4247-af8d-980e59fbbec6 Accessed 9/5/2018.

temazepam is considered to have psychoactive effects is between 0.017 and 0.132 ug/ml.[12]

Personal Medical Records: Primary Care

Records from the pilot's first visit to a primary care doctor in Georgia (8/25/2015) through to his last visit (12/22/2016) were reviewed. The pilot reported to the physician that he had asthma, high cholesterol, anxiety, panic attacks, post traumatic stress disorder (PTSD), insomnia, daily headaches, gastroesophageal reflux disease (GERD), and prostate issues. He reported his previous physician had been prescribing albuterol, atorvastatin, clonazepam, temazepam, Tylenol with codeine #3, amitriptyline, topiramate, omeprazole, finasteride, and tamsulosin for these conditions. He also used high dose steroids periodically for his asthma.

The primary care provider referred the pilot to a neurologist for further evaluation of his headaches (see below) and continued his medication regimen.

The pilot made several visits for asthma exacerbations. The only comment in the record regarding the status or degree of control of the pilot's anxiety, insomnia, and PTSD were that they were "stable" in December 2015.

The primary care provider eventually added fenofibrate to control the pilot's triglyceride level. Both he and the neurologist were writing various prescriptions for the pilot's opioid and benzodiazepines. At some point, the amitriptyline and topiramate were discontinued (the record does not specify a date). For reasons that were not described, the pilot was placed on nortriptyline in April 2016 but it was discontinued in May 2016.

[Other medications are described above.

Tylenol with codeine #3 or acetaminophen and codeine are a combination tablet containing 325 mg of acetaminophen and 30 mg of codeine. These tablets are available by prescription as a Schedule III controlled substance. There are three performance related warnings: 1) "some people have a genetic variation that results in codeine changing into morphine more rapidly and completely than other people. Most people are unaware of whether they are an ultra-rapid codeine metabolizer or not. These higher-than-normal levels of morphine in the blood may lead to life-threatening or fatal respiratory depression or signs of overdose such as extreme sleepiness, confusion, or shallow breathing;" 2) "Codeine may impair mental and/or physical abilities required for the performance of potentially

[12] Federal Aviation Administration. Civil Aerospace Medical Institute. Toxicology Drug Information: Temazepam. http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=193 Accessed 9/6/2018.

hazardous tasks such as driving a car or operating machinery. Such tasks should be avoided while taking this product;" and 3) "Alcohol and other CNS depressants may produce an additive CNS depression, when taken with this combination product, and should be avoided."[13]

Amitriptyline is a tricyclic antidepressant often marketed with the name Elavil. It carries this performance warning, "patients should be advised as to the possible impairment of mental and/or physical abilities required for performance of hazardous tasks, such as operating machinery or driving a motor vehicle."[14]

Topiramate, also called Topamax, is an antiseizure medication that is also used to treat bipolar disease and as to prevent migraines. It is well known to cause somnolence and cause cognitive dysfunction and mood changes that appear to be dose related.[15]

Omeprazole is a medication used to treat heartburn from various causes. It is available over the counter and by prescription and is often marketed with the name Prilosec. It is not considered impairing.]

Personal Medical Records: Neurology

According to records from the pilot's neurologist, he had a long history of chronic headaches and was initially evaluated by the neurologist in October 2015. At that time, his neurologic exam was normal and he was using two Tylenol with codeine (#3) tablets a day for headaches. Because of a concern about liver damage from the acetaminophen (Tylenol), his prescription was changed to one hydrocodone and ibuprofen tablet per day (milligrams of hydrocodone were not recorded). These were regularly refilled. The neurologist noted at that time that his other medical conditions included anxiety, panic attacks, asthma and high cholesterol and that he was taking Lipitor, TriCor, an inhaler, clonazepam and temazepam to treat those conditions. He also noted the pilot was on topiramate with an unknown dosing regimen.

The pilot made a number of visits to the neurologist for refills of his hydrocodone/ibuprofen.

## D. SUMMARY OF MEDICAL FINDINGS

[13] National Institutes of Health. US National Library of Medicine. DailyMed. Acetaminophen and codeine. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=8171ecb8-fc2e-4980-8d43-2f03cf972ac8 Accessed 9/6/2018.
[14] National Institutes of Health. US National Library of Medicine. DailyMed. Amitriptyline. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=1e6d2c80-fbc8-444e-bdd3-6a91fe1b95bd Accessed 9/6/2018.
[15] National Institutes of Health. US National Library of Medicine. DailyMed. Topiramate. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6f9d59e3-d10d-48f3-af01-83ba3e1e3a2b Accessed 9/5/2018.

The 69 year old male pilot had reported having frequent headaches, prostate problems, a corneal transplant (1982), asthma, high blood pressure, depression and anxiety that resolved in 2001, and a rotator cuff repair to the FAA. His medications at the time of his last aviation medical exam (2016) were reported as inhaled albuterol for his asthma (also called Ventolin or ProAir), atorvastatin and fenofibrate for his high cholesterol (also called Lipitor and TriCor respectively), and finasteride and tamsulosin to treat his prostate symptoms (also called Proscar and Flomax, respectively). These medications are not considered impairing.

The pilot had previously failed to report treatment for depression and anxiety to the FAA and his medical certificate was revoked for this failure for a period of one year in 2000-2001.

According to the autopsy performed by Division of Forensic Sciences, Georgia Bureau of Investigation, the cause of death was blunt traumatic injuries. Only a small portion of the brain was available to be examined, due to the extent of injury. No significant natural disease was identified.

Toxicology testing identified atorvastatin in liver and cavity blood. In addition, clonazepam and its metabolite 7-aminoclonazepam, hydrocodone and its active metabolite dihydrocodeine, diphenhydramine, nortriptyline, and temazepam in liver. In addition, 0.031 ug/ml of 7-aminoclonazepam, 0.016 ug/ml of hydrocodone and an unquantified amount of dihydrocodeine, 0.129 ug/ml of diphenhydramine, and unquantified amount of nortriptyline, and 0.068 ug/ml of temazepam were identified in cavity blood.

To his personal physician, the pilot reported in 2015 having asthma, high cholesterol, anxiety, panic attacks, post traumatic stress disorder (PTSD), insomnia, daily headaches, gastroesophageal reflux disease (GERD), and prostate issues. He reported his previous physician had been prescribing albuterol, atorvastatin, clonazepam, temazepam, Tylenol with codeine #3, amitriptyline, topiramate, omeprazole, finasteride and tamsulosin. At his last visit, dated 12/22/2016, the pilot's medications included albuterol, atorvastatin, clonazepam, temazepam, hydrocodone/ibuprofen, finasteride, and tamsulosin.