



# **NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Research and Engineering  
Washington, DC

## **Medical Factual Report** **May 27, 2021**

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Medical Officer

### **A. ACCIDENT: ERA20LA312; Sweetwater, Tennessee**

Location: ½ mile from West Wind Airpark (TN64)  
Date/Time: September 10, 2020; 4:00 p.m. (EDT)  
Aircraft: Quad City Challenger II, N56906  
Injuries: 1 Fatal  
Flight Conducted under Part 91 personal 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 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 report, personal medical records, and FAA Forensic Sciences Laboratory toxicology<sup>1</sup> report were reviewed. Other pertinent scientific and regulatory issues were reviewed.

#### **FAA Medical Case Review**

According to the FAA medical case review, the 53-year-old male sport pilot's most recent FAA medical certification examination was in 1995. At that time, he reported the use of no medications and having no medical concerns. He was issued a third class medical certificate without limitations.

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

### Autopsy

According to the autopsy performed by the Regional Forensic Center, Knox County, Knoxville, Tennessee for McMinn County, the cause of death for the pilot was multiple blunt force injuries and the manner of death was accident. No significant natural disease was identified.

### Personal Medical Records

The pilot's medical records were obtained from his primary care doctor's office for the last three years; the records also included notes from office visits from several specialists. The records from various physicians noted that the pilot was also using the Veterans Affairs clinics for medical care and prescriptions.

The most recent primary care office visit occurred the day before the accident on 9/9/20 as a follow-up from the pilot's visit with his infectious disease doctor and hospitalization for bacteremia and an acute bone infection. The pilot was 170 centimeters tall, weighed 96 kilograms, and had a body mass index of 33. The pilot's chronic medical conditions included type 2 diabetes with uncontrolled hyperglycemia, diabetic retinopathy, and diabetic nephropathy treated with insulin; stage 3 (moderate) chronic kidney disease; sarcoidosis treated with prednisone and noted as stable; liver cirrhosis noted as stable; hypothyroidism treated with levothyroxine; new onset gastric reflux disease; and mild major depression. His depression was noted as stable, treated with duloxetine, and the pilot was noted to have a normal mood and affect with intact thought process and content. Notes from his orthopedic surgeon and the kidney center report his use of escitalopram and trazodone for treating depression in the last year. The orthopedic consultation report from 7/22/20 also mentioned the pilot's daily use of the anti-anxiety medication alprazolam (commonly marketed as Xanax) and gabapentin.

Summary notes from visits to the pilot's ophthalmologist on 8/21/20 and 6/29/20 for injections of an anti-growth factor drug into his right eye for diabetic retinopathy were included in the primary care medical records. The pilot was also reported to have a vitreous hemorrhage, posterior vitreous detachment, and suspected glaucoma in his right eye. At the 8/21/20 visit, the pilot reported that he had mild central vision cloudiness in his right eye that had improved from his visit on 6/29/20. The ophthalmologist reported that the pilot's had phthisis of his left eye (end-stage eye) and had no light perception or vision.

Hospital records were obtained for the three years prior to the accident. The pilot had over two dozen single day or overnight hospital admissions in the previous three years for procedures, diagnostics, and treatment of acute exacerbations or complications of his chronic medical conditions. The most recent hospitalization occurred about one month before the accident and was for a two-week period; he was admitted to the hospital between 7/31/20 and 8/14/20 for intravenous antibiotic treatment for sepsis and an acute bone infection. His discharge medications and medications provided from the hospitalization included promethazine and hydroxyzine.

### Toxicology

FAA Forensic Sciences Laboratory toxicology testing detected the inactive metabolite of tetrahydrocannabinol (THC), carboxy-delta-9-tetrahydrocannabinol (THC-COOH), in the pilot's liver and lung tissue. Gabapentin, promethazine, norchlorcyclizine, duloxetine, citalopram, its

metabolite n-desmethylocitalopram, and trazodone were detected in the pilot's liver tissue; except for trazodone, these compounds were also detected in the pilot's muscle tissue. Toxicology testing performed for the Regional Forensic Center was negative for alcohol and tested for drugs of abuse in the pilot's muscle tissue.

#### Description of Identified Substances and Medical Conditions

The *marijuana* plant (*Cannabis sativa*) contains chemicals called cannabinoids; THC is the primary psychoactive cannabinoid compound. THC's mood-altering effects include euphoria and relaxation. In addition, marijuana causes alterations in motor behavior, perception, and cognition. Significant performance impairments are usually observed for at least 1-2 hours following marijuana use, and residual effects have been reported up to 24 hours.<sup>2</sup>

THC is rapidly metabolized but the rate of metabolism is not linear and depends on the means of ingestion (smoking, oil, and edibles), potency of the product, frequency of use, and user characteristics. The primary metabolite, 11-hydroxy-delta-9-THC, is equally psychoactive, but is rapidly metabolized to the non-psychoactive metabolite *THC-COOH*. THC is fat soluble, so is stored in fatty tissues and can be released back into the blood long after consumption. So, while the psychoactive effects may last a few hours, THC can be detected in the blood for days or weeks. Very little THC is excreted in urine. Instead, THC-COOH can be found in urine days to weeks after the last use of the drug. Thus, both blood and urine test results do not necessarily reflect recent use and cannot be used to prove that the user was under the influence of the drug at the time of testing.<sup>3</sup>

*Gabapentin*, commonly marketed as Neurontin, is an antiseizure medication that is also used to treat chronic nerve pain and postherpetic neuralgia (shingles). It carries a warning that it "may cause dizziness, somnolence and other symptoms and signs of central nervous system depression" and patients should be advised not to operate complex machinery "until they have gained sufficient experience on gabapentin to assess whether gabapentin impairs their ability to perform such tasks." Gabapentin has a long half-life that ranges from 6.5 to 52 hours.<sup>4,5</sup>

*Promethazine* is a prescription medication used to relieve allergy symptoms, for sedation before surgery, and to prevent and control nausea and vomiting that may occur after surgery. Drowsiness can occur and patients should be cautioned against driving or operating machinery while using promethazine.<sup>6</sup>

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<sup>2</sup> National Highway Traffic Safety Administration. April 2014. Drugs and Human Performance Fact Sheets. Cannabis/Marijuana. <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf>

<sup>3</sup> Compton, R. July 2017. Marijuana-Impaired Driving - A Report to Congress. (DOT HS 812 440). Washington, DC: National Highway Traffic Safety Administration. <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/812440-marijuana-impaired-driving-report-to-congress.pdf>

<sup>4</sup> National Institutes of Health (NIH). U.S. National Library of Medicine (NLM). DailyMed. Updated 12/31/20. Gabapentin capsule. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=7538e255-95df-4991-aae0-a90d709f1e95>

<sup>5</sup> FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Gabapentin. <https://jag.camii.jccbi.gov/toxicology/DrugDetail.asp?did=254>

<sup>6</sup> NIH NLM. Last revised 6/15/17. [Promethazine: MedlinePlus Drug Information](#)

One of the metabolites of hydroxyzine is the inactive metabolite *norchlorcyclizine*.<sup>7</sup> Norchlorcyclizine is slowly excreted in the urine, with measurable amounts detected up to three weeks after stopping chronic oral use.<sup>8</sup> Hydroxyzine is prescribed for symptomatic relief of anxiety and tension, managing itching due to allergies, and as a sedative for general anesthesia. Drowsiness can occur and patients should be cautioned against driving or operating machinery while using hydroxyzine.<sup>9</sup>

*Duloxetine*, commonly marketed as Cymbalta, is a prescription medication used to treat depression, anxiety, and chronic musculoskeletal pain. Duloxetine carries the warning that its use may impair mental and physical ability to perform potentially hazardous tasks. The therapeutic range is 22 to 55 ng/mL and it has a half-life of 8 to 17 hours.<sup>10,11</sup>

*Citalopram* is a prescription antidepressant medication marketed as Celexa; citalopram is a mix of left and right-handed molecules. Escitalopram, commonly marketed as Levopro, is a prescription antidepressant that contains only left-handed molecules of citalopram.<sup>12</sup> *N-desmethylcitalopram* is the active metabolite of citalopram. All carry the warning that their use may impair mental or physical ability for performing hazardous tasks. The therapeutic range for citalopram or escitalopram is 50 to 110 ng/mL and the half-life is 25 to 35 hours.<sup>13,14,15</sup> Citalopram and escitalopram are two of the four FAA approved antidepressant medications.<sup>16</sup>

*Trazodone* is a medication prescribed to treat depression, anxiety, and insomnia. Trazodone can be sedating. It comes with this warning, “Trazodone hydrochloride tablets may cause somnolence or sedation and may impair the mental and/or physical ability required for the performance of potentially hazardous tasks. Patients should be cautioned about operating hazardous machinery, including automobiles, until they are reasonably certain that the drug treatment does not affect them adversely.” The therapeutic range is 500 to 2,500 ng/mL and it has a half-life of 4 to 7 hours.<sup>17,18</sup>

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<sup>7</sup> Kageura, M, M Kataoka, K Hara, and T Nagata. 1986. Changed compounds of hydroxyzine in a human urine. *Forensic Science International*. 32(4):229-235.

<sup>8</sup> DrugBank. Updated 5/6/21. [Chlorcyclizine: Uses, Interactions, Mechanism of Action | DrugBank Online](#)

<sup>9</sup> NIH NLM. Updated 11/27/19 [DailyMed - HYDROXYZINE HYDROCHLORIDE tablet, film coated \(nih.gov\)](#)

<sup>10</sup> NIH NLM. Updated 12/22/20. [DailyMed - DULOXETINE capsule, delayed release \(nih.gov\)](#)

<sup>11</sup> FAA. Updated 1/16/19. Forensic Toxicology Drug Information. Duloxetine.

<https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=264>

<sup>12</sup> According to a personal communication with the FAA Forensic Sciences Laboratory, the laboratory does not differentiate between citalopram and escitalopram in their testing.

<sup>13</sup> FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Citalopram.

<https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=208>

<sup>14</sup> FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Desmethylcitalopram (N-).

<https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=178>

<sup>15</sup> NIH NLM. Updated 10/22/20. [DailyMed - ESCITALOPRAM- escitalopram oxalate tablet, film coated \(nih.gov\)](#)

<sup>16</sup> 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/item\\_47/amd/antidepressants/](https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/app_process/exam_tech/item_47/amd/antidepressants/)

<sup>17</sup> NIH NLM. Updated 11/19/19. [DailyMed - TRAZODONE HYDROCHLORIDE tablet \(nih.gov\)](#)

<sup>18</sup> FAA. Updated 1/16/19. Forensic Toxicology Drug Information. Trazodone.

<http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=200>

### *Depression*

Major depression itself is associated with significant cognitive degradation, particularly in executive functioning.<sup>19</sup> The cognitive degradation may not improve even with remission of the depressed episode, and patients with severe disease are more significantly affected than those with fewer symptoms or episodes.<sup>20,21</sup> The FAA finds depression and use of antidepressants to be disqualifying, although pilots who can demonstrate they are stable in remission on a small set of medications may be issued a special issuance medical certificate.

## **D. SUMMARY OF MEDICAL FINDINGS**

At the time of the accident, the 53-year-old male pilot did not hold a current medical certificate; his last FAA medical certification examination was in 1995. Based on personal medical records, the pilot was being treated for uncontrolled diabetes requiring insulin, chronic kidney disease, sarcoidosis, liver cirrhosis, hypothyroidism, gastric reflux disease, joint pain, and mild major depression. The pilot had no vision in his left eye and his right eye had diabetic retinopathy, vitreous hemorrhage and detachment, and suspected glaucoma. One month before the accident, the pilot was hospitalized for two weeks to receive intravenous antibiotics for sepsis and an acute bone infection. According to the autopsy report, the cause of death for the pilot was multiple blunt force injuries and the manner of death was accident. No significant natural disease was identified.

Toxicology testing detected THC-COOH, the inactive metabolite of THC, in the pilot's liver and lung tissue. Gabapentin, promethazine, norchlorcyclizine, duloxetine, citalopram, its metabolite n-desmethylcitalopram, and trazodone were detected in the pilot's liver tissue; except for trazodone, these compounds were also detected in the pilot's muscle tissue.

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<sup>19</sup> Snyder HR. 2013. Major depressive disorder is associated with broad impairments on neuropsychological measures of executive function: A meta-analysis and review. *Psychol Bull.* 139(1):81-132.

<sup>20</sup> Nakano Y, Baba H, Maeshima H, Kitajima A, Sakai Y, Baba K, Suzuki T, Mimura M, Arai H. 2008. Executive dysfunction in medicated, remitted state of major depression. *J Affect Disord.* 111(1):46-51.

<sup>21</sup> Paelecke-Habermann Y, Pohl J, Leplow B. 2005. Attention and executive functions in remitted major depression patients. *J Affect Disord.* 89(1-3):125-135.