

# National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



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**MEDICAL**

Specialist's Factual Report

July 23, 2024

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## **A. ACCIDENT**

Location: North Las Vegas, Nevada  
Date: July 17, 2022

## **B. MEDICAL SPECIALIST**

Specialist Turan Kayagil, MD, FACEP  
National Transportation Safety Board  
Washington, DC

## **C. DETAILS OF THE INVESTIGATION**

### **1.0 Purpose**

This investigation was performed to evaluate the Piper pilot-rated left seat occupant (Piper pilot), Piper pilot-rated right seat occupant (Piper copilot), Cessna certificated flight instructor (CFI), and Cessna student pilot for potentially impairing substances and medical conditions.

### **2.0 Methods**

The autopsy and toxicology reports for the four involved pilots were reviewed, as was the Federal Aviation Administration (FAA) medical case review. The Piper pilot's FAA medical certification file was reviewed, as were BasicMed documents recovered from his logbook, and selected pre-crash medical records. Selected investigator reports and relevant regulation and medical literature were also reviewed.

## **D. FACTUAL INFORMATION**

### **1.0 Piper PA-46 (N97CX)**

#### **1.1 Piper Pilot**

##### **1.1.1 Pre-Crash Medical Records**

Records were requested from the Piper pilot's cardiologist from the 3 years before the accident date. According to these records, the Piper pilot's medical history included hypertension, hyperlipidemia, aortic valve replacement with a bioprosthetic valve in 2014 (for aortic insufficiency), chronic occlusion of his right carotid artery, cataracts (noted in past medical history section of reviewed notes without additional comment), recurrent urinary tract infections, and a remote history of mastoiditis

treated with mastoidectomy. Additionally, the Piper pilot had a history of atrial flutter, for which he had undergone cardiac ablation and permanent pacemaker placement in December 2017. He had had a mini-stroke around 2014 (possibly related to atrial flutter) and had been on a blood thinner (apixaban, for stroke prevention) until November 2020, when a pacemaker interrogation had not shown any atrial fibrillation and his cardiologist had discontinued the blood thinner.

The Piper pilot's last cardiology visit was on May 16, 2022, for comprehensive care follow up. At that time he was 74 inches tall and weighed 211 pounds. He reported some episodes of lightheadedness without other cardiac symptoms. The cardiologist noted that the Piper pilot had unremarkable laboratory testing, with normal cardiac left ventricular function and an appropriately functioning bioprosthetic aortic valve. Study results noted in the visit note included an echocardiogram in November 2020 that showed moderate left ventricular hypertrophy and mild multivalvular regurgitation. The Piper pilot's documented medications as of the May 16, 2022, cardiology visit were ibuprofen (an anti-inflammatory medication commonly available over the counter to treat pain and fever), baby aspirin (an over-the counter anti-inflammatory medication commonly used to reduce cardiovascular risk), atorvastatin (a prescription medication commonly used to manage cholesterol and reduce cardiovascular risk), d-mannose (a sugar supplement that may be used with the intention of preventing or treating urinary infections), saw palmetto (a supplement that may be used with the intention of reducing urinary symptoms associated with prostate enlargement), and vitamins; none of these medications are generally considered impairing. The cardiologist documented that the pilot's episodes of dizziness were stable and mild, and planned to have the Piper pilot continue his current medications and follow up again in 2 months after some planned international travel.

Records were also requested from the Piper pilot's ear, nose, and throat (ENT) specialist's practice from the 3 years before the accident date. Reviewed ENT records documented that the pilot's medical history included chronic left mastoiditis treated with mastoidectomy, requiring periodic mastoid cavity debridement, including at his most recent documented ENT visit in November 2021. The Piper pilot also had hearing loss in both ears. An October 2019 ENT note documented that the Piper pilot had had poor hearing in his left ear since surgeries for mastoiditis in the 1950s, and had also had progressive right-sided hearing loss with tinnitus. A temporal bone computed tomography scan in October 2019 showed disruption of the left ossicular chain, with only small residual fragments of malleus and incus, and poorly visualized residual stapes. Audiometry performed in October 2019 identified moderate-severe to profound mixed conductive and sensorineural hearing loss in each ear (right and left) at all tested frequencies, from 250 to 8000 Hz. Pure-tone thresholds at 500, 1000, 2000, and 3000 Hz were all 70 dB or louder in each ear (normal is 25 dB or quieter). Speech discrimination was 84% at an intensity of 100 dB in the right ear (not scored in

the left ear at 105 dB). Speech reception thresholds were 75 dB in each ear (consistent with pure tone averages).<sup>1</sup>

### **1.1.2 FAA Medical Certification Information**

According to reviewed records, the 82-year-old male Piper pilot's last aviation medical examination was October 17, 2017. At that time, he reported 6,350 total civilian flight hours. He reported using aspirin, atorvastatin, and a multivitamin. His reported medical history included a remote history of mastoidectomy and tympanic membrane reconstruction procedures on the left side. He answered "no" to a question about whether he had ever had heart or vascular trouble. The aviation medical examiner (AME) noted a right-sided hearing aid and a systolic heart murmur on physical examination. The AME documented that the pilot passed a conversational voice hearing test at 6 feet, and that the heart murmur was asymptomatic. The AME issued the pilot a third-class medical certificate limited by a requirement to wear lenses for distant vision and have glasses for near vision. That medical certificate expired in 2019.

The Piper pilot completed a BasicMed education course and reported completing a BasicMed Comprehensive Medical Examination Checklist (CMEC), both most recently on May 16, 2022.<sup>2</sup> To fly as pilot in command or as a required flightcrew member under the provisions of BasicMed, a pilot with a cardiac valve replacement must have completed the process for obtaining an Authorization for Special Issuance for that condition.<sup>3</sup> The Piper pilot had not done this.

### **1.1.3 BasicMed Documents**

The Piper pilot's logbook contained copies of a BasicMed education course completion certificate and CMEC form signed by his cardiologist. Both of these documents were dated May 16, 2022. On the CMEC form, the Piper pilot answered "yes" to a question about whether he had ever had heart or vascular trouble. He reported using the medications aspirin and atorvastatin, as well as multivitamins. He also reported using the supplement glucosamine (which is not generally considered

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<sup>1</sup> For general information about audiometry, see the Centers for Disease Control and Prevention handout, "[Inquiring Ears Want to Know](#)." The interested reader may also compare the Piper pilot's audiometry results with [hearing standards documented in the FAA's Guide for Aviation Medical Examiners](#) (although these standards are for pilots seeking FAA medical certification).

<sup>2</sup> BasicMed provisions allow pilots who meet certain requirements to fly (as pilot in command or as a required flightcrew member) without current medical certification. Among those requirements, a pilot must have completed a BasicMed education course within 24 calendar months and must have had a medical examination with a state-licensed physician using the CMEC within 48 months. Aircraft and operating restrictions also apply. For details, see [14 Code of Federal Regulations \(CFR\) Part 68](#), [14 CFR 61.113\(i\)](#), [14 CFR 61.23\(c\)\(3\)](#), and [https://www.faa.gov/licenses\\_certificates/airmen\\_certification/basic\\_med/](https://www.faa.gov/licenses_certificates/airmen_certification/basic_med/).

<sup>3</sup> [14 CFR 68.9\(a\)\(3\)\(iii\)](#).

impairing and is commonly taken with the intent of promoting joint cartilage health). No medical condition was identified by the signing cardiologist that, in the opinion of the cardiologist, could interfere with the Piper pilot's ability to safely operate an aircraft.

#### **1.1.4 Autopsy**

The Clark County Coroner's Office performed the Piper pilot's autopsy. According to the Piper pilot's autopsy report, his cause of death was blunt trauma and his manner of death was accident. The pilot's heart weighed 730 grams (normal heart weight is roughly 280-500 grams for a male of the pilot's body weight of 204 pounds at autopsy), with dilation of both cardiac ventricles; thicknesses were 1.6 cm for the left ventricle wall (normal is roughly 0.9-1.6 cm), 0.3 cm for the right ventricle wall (normal is roughly 0.2-0.6 cm), and 1.5 cm for the intraventricular septum (normal is roughly 1-1.8 cm).<sup>4</sup> A prosthetic aortic valve was present, as was an implantable medical device with wiring extending to the heart.<sup>5</sup> Mild coronary artery disease was also present, as was moderate aortic atherosclerosis. The remainder of the autopsy, including of the heart, did not identify any other significant natural disease.

#### **1.1.5 Toxicology**

At the request of the Coroner's Office, NMS Labs performed testing of postmortem specimens from the Piper pilot. A vitreous chemistry test was generally unremarkable. Caffeine was presumptively detected (detected by a preliminary test without a second test to confirm) in peripheral blood; no other tested-for substances were detected in peripheral blood.<sup>6</sup>

The FAA Forensic Sciences Laboratory also performed postmortem testing of specimens from the Piper pilot. Urine glucose measured in a normal range and no other tested-for substances were detected.<sup>7</sup>

Caffeine is a central nervous system stimulant that is commonly ingested, including in coffee, tea, soft drinks, and chocolate; it is also an ingredient in certain anti-drowsiness medications and headache medications. Caffeine is not generally considered impairing.

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<sup>4</sup> Kitzman DW, Scholz DG, Hagen PT, Ilstrup DM, Edwards WD. Age-related changes in normal human hearts during the first 10 decades of life. Part II (maturity): a quantitative anatomic study of 765 specimens from subjects 20 to 99 years old. *Mayo Clin Proc.* 1988;63(2):137-146. doi:10.1016/s0025-6196(12)64946-5.

<sup>5</sup> The implantable medical device (which the Pilot's medical records indicated was a pacemaker) was not retained by the Coroner's Office and there was no record that it was interrogated.

<sup>6</sup> Peripheral blood underwent [NMS Labs Test Code 8052B](#).

<sup>7</sup> The FAA Forensic Sciences laboratory has the capability to test for around a thousand substances including toxins, prescription and over-the-counter medications, and illicit drugs.

## **1.2 Piper Copilot**

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

According to the FAA medical case review, the 76-year-old female Piper copilot's last aviation medical examination was June 10, 2020. At that time, she reported 1,360 total civilian flight hours. She was 62 inches tall and weighed 114 pounds. She reported a history of 2016 bilateral cataract surgery, as well as a history of Graves' disease treated with thyroid ablation, resulting in low thyroid hormone, for which she reported using thyroid hormone replacement medication. She had been granted an FAA Authorization for Special Issuance of medical certification for low thyroid hormone and use of medication in 2010 and subsequently received an FAA Letter of Eligibility in 2014 for low thyroid hormone, Graves' disease, and bilateral exophthalmos. At her last aviation medical examination, the Piper copilot reported using the medications levothyroxine (a prescription thyroid hormone replacement medication), rosuvastatin (a prescription medication commonly used to control cholesterol and reduce cardiovascular risk), celecoxib (a prescription medication commonly used to treat arthritis-related pain and inflammation), glucosamine (a dietary supplement commonly taken with the intent of promoting joint cartilage health), and a multivitamin. No significant issues were identified, and the Piper copilot was issued a third-class medical certificate limited by a requirement to wear corrective lenses. That medical certificate expired at the end of June 2022.

The Piper copilot completed a BasicMed education course in June 2022, and reported completing a BasicMed Comprehensive Medical Examination Checklist (CMEC) most recently in June 2020.<sup>2</sup>

### **1.2.2 Autopsy**

The Clark County Coroner's Office performed the Piper copilot's autopsy. According to the Piper copilot's autopsy report, her cause of death was blunt trauma and her manner of death was accident. Her autopsy did not identify evidence of significant natural disease.

### **1.2.3 Toxicology**

At the request of the Coroner's Office, NMS Labs performed testing of postmortem specimens from the Piper copilot. A vitreous chemistry test was generally unremarkable. Caffeine was presumptively detected (detected by a preliminary test without a second test to confirm) in peripheral blood; no other tested-for substances were detected in peripheral blood.<sup>6</sup>



The FAA Forensic Sciences Laboratory also performed postmortem testing of specimens from the Piper copilot.<sup>7</sup> This testing detected atorvastatin and desloratadine in heart blood and urine.

Caffeine is described in section D.1.1.5 above. Atorvastatin is a prescription medication commonly used to control cholesterol and reduce cardiovascular risk. Desloratadine is a prescription non-sedating antihistamine medication that is commonly used for relief of seasonal allergy symptoms; desloratadine also is an active metabolite of loratadine, a non-sedating antihistamine medication available over the counter for similar uses as desloratadine. Caffeine, atorvastatin, and desloratadine are not generally considered impairing.

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## **2.0 Cessna 172 (N160RA)**

### **2.1 Cessna Flight Instructor**

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

According to the FAA medical case review, the 40-year-old male Cessna CFI's last aviation medical examination was August 6, 2021. At that time, he reported 352 total civilian flight hours. He was 74 inches tall and weighed 188 pounds. He reported no medication use or active medical conditions. No significant issues were identified, and he was issued a first-class medical certificate limited by a requirement to wear corrective lenses.

#### **2.1.2 Autopsy**

The Clark County Coroner's Office performed the Cessna CFI's autopsy. According to the Cessna CFI's autopsy report, his cause of death was blunt trauma and his manner of death was accident. Diffuse thermal injury was present. Both ventricles of the Cessna CFI's heart were described as dilated. The heart weighed 350 grams (normal heart weight is roughly 270-480 grams for a male of body weight 188 pounds); thicknesses were 1 cm for the left ventricle wall (normal is roughly 0.9-1.6 cm), 0.2 cm for the right ventricle wall (normal is roughly 0.2-0.6 cm), and 1.2 cm for the intraventricular septum (normal is roughly 1-1.8 cm).<sup>4</sup> The remainder of the heart examination, including of the coronary arteries, did not identify other evidence of natural disease. Hydronephrosis of the left kidney was present, with stones in the renal pelvis of the left kidney; the right kidney and bladder were unremarkable and the bladder contained abundant urine. The remainder of the autopsy did not identify other significant natural disease.

### **2.1.3 Toxicology**

At the request of the Coroner's Office, NMS Labs performed testing of postmortem specimens from the Cessna CFI. A vitreous chemistry test showed an elevated vitreous creatinine of 5.58 mg/dL (normal range stated as 0.6-1.3 mg/dL) and vitreous potassium of 30.7 mmol/L (normal range stated as less than 15 mmol/L). Vitreous chemistry was otherwise unremarkable, including normal vitreous urea nitrogen. Caffeine was presumptively detected (detected by a preliminary test without a second test to confirm) in peripheral blood; no other tested-for substances were detected in peripheral blood.<sup>6</sup> Carboxyhemoglobin testing of cavity blood was normal.

The FAA Forensic Sciences Laboratory also performed postmortem testing of specimens from the Cessna CFI. Vitreous glucose measured in a normal range and no other tested-for substances were detected.<sup>7</sup>

Caffeine is described in section D.1.1.5 above. It is not generally considered impairing.

## **2.2 Cessna Student Pilot**

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

According to the FAA medical case review, the 47-year-old male Cessna student pilot's only aviation medical examination was October 16, 2020. At that time, he reported 15 total civilian flight hours. He was 75 inches tall and weighed 162 pounds. He reported using a testosterone replacement injection. He reported a history of a 2011 driving under the influence (DUI) arrest without a conviction. No significant issues were identified, and he was issued a third-class medical certificate without limitation. In June 2021, the FAA issued him a Letter of Eligibility for his 2011 DUI arrest.

### **2.2.2 Autopsy**

The Clark County Coroner's Office performed the Cessna student pilot's autopsy. According to the Cessna student pilot's autopsy report, his cause of death was blunt trauma and his manner of death was accident. Diffuse thermal injury was present and structural evaluation of the brain was limited. The left anterior descending coronary artery was 50% narrowed by plaque. The ventricles of the heart were described as dilated. Heart weight was 470 grams (normal heart weight is roughly 250-440 grams for a male of body weight 162 pounds).<sup>4</sup> The remainder of the autopsy, including visual examination of the heart, was without other evidence of significant natural disease.

### 2.2.3 Toxicology

At the request of the Coroner's Office, NMS Labs performed testing of postmortem specimens from the Cessna student pilot. A vitreous chemistry test showed a vitreous creatinine of 1.65 mg/dL (normal range stated as 0.6-1.3 mg/dL), vitreous potassium of 24.7 mmol/L (normal range stated as less than 15 mmol/L), vitreous urea nitrogen of 27.1 mg/dL (normal range stated as 8-20 mg/dL), and sodium of 113 mmol/L (normal range stated as 135-150 mmol/L); vitreous chemistry results were otherwise unremarkable, and the medical examiner documented a diagnosis of hyponatremic dehydration. Caffeine and cotinine were presumptively detected (detected by a preliminary test without a second test to confirm) in peripheral blood; no other tested-for substances were detected in peripheral blood.<sup>6</sup> Carboxyhemoglobin testing of cavity blood was normal.

The FAA Forensic Sciences Laboratory also performed postmortem testing of specimens from the Cessna student pilot. Vitreous glucose measured in a normal range and no other tested-for substances were detected.<sup>7</sup>

Caffeine is described in section D.1.1.5 above. Cotinine is a metabolite of nicotine, which is a chemical that is found in tobacco products, electronic cigarette liquid, and certain smoking cessation aids.<sup>8</sup> Caffeine and nicotine/cotinine are not generally considered impairing.

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## E. SUMMARY OF MEDICAL FACTS

### 1.0 Piper Pilot

The 82-year-old male Piper pilot's medical history included hypertension, hyperlipidemia, aortic valve replacement with a bioprosthetic valve in 2014, mini-stroke around 2014, chronic right carotid artery occlusion, atrial flutter controlled without the need for anticoagulation following cardiac ablation and pacemaker placement in December 2017, chronic left mastoiditis treated with mastoidectomy decades ago, marked hearing loss affecting both ears, cataracts, and recurrent urinary tract infections. His medical records documented the use of multiple medications that are not generally considered impairing.

The Piper pilot's last aviation medical examination was October 17, 2017. At that time, he reported his remote history of mastoidectomy and tympanic membrane

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<sup>8</sup> National Institutes of Health National Library of Medicine. Nicorette. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=991704ed-781a-489b-8b56-0b558e8fc385>. Updated March 21, 2024. Accessed July 16, 2024.

reconstruction procedures on the left side. He answered “no” to a question about whether he had ever had heart or vascular trouble. The aviation medical examiner (AME) noted a right-sided hearing aid and a systolic heart murmur on physical examination. The AME documented that the pilot passed a conversational voice hearing test at 6 feet, and that the heart murmur was asymptomatic. The AME issued the pilot a third-class medical certificate limited by a requirement to wear lenses for distant vision and have glasses for near vision. That medical certificate expired in 2019.

The Piper pilot completed a BasicMed education course and a BasicMed Comprehensive Medical Examination Checklist (CMEC), both most recently on May 16, 2022. On the most recent CMEC form, the Piper pilot answered “yes” to a question about whether he had ever had heart or vascular trouble. His cardiologist signed the CMEC form and did not identify any condition that, in the cardiologist’s opinion, could interfere with the Piper pilot’s ability to safely operate an aircraft. The pilot had not obtained an Authorization for Special Issuance for his heart valve replacement, so was not eligible to fly as pilot in command or as a required flightcrew member under the provisions of BasicMed.

According to the Piper pilot’s autopsy report, his cause of death was blunt trauma and his manner of death was accident. The pilot’s heart weight was elevated, with dilation of both cardiac ventricles. A prosthetic aortic valve was present, as was an implantable medical device with wiring extending to the heart. Mild coronary artery disease was also present, as was moderate aortic atherosclerosis. The remainder of the autopsy, including of the heart, did not identify other significant natural disease. Postmortem toxicological testing of specimens from the Piper pilot did not detect any tested-for substances that are generally considered impairing, and a postmortem vitreous chemistry test was generally unremarkable.

## **2.0 Piper Copilot**

The 76-year-old female Piper copilot’s last aviation medical examination was June 10, 2020. At that time, she reported a history of 2016 bilateral cataract surgery, as well as a history of Graves’ disease treated with thyroid ablation, resulting in low thyroid hormone, for which she reported using thyroid hormone replacement medication. She had been granted an FAA Authorization for Special Issuance of medical certification for low thyroid hormone and use of medication in 2010 and subsequently received an FAA Letter of Eligibility in 2014 for low thyroid hormone, Graves’ disease, and bilateral exophthalmos. At her last aviation medical examination, the Piper copilot reported using the medications, rosuvastatin, celecoxib, glucosamine, and a multivitamin. No significant issues were identified, and the Piper copilot was issued a third-class medical certificate limited by a requirement to wear corrective lenses. That medical certificate expired at the end of June 2022. The Piper copilot completed a BasicMed education course in June 2022, and reported

completing a BasicMed Comprehensive Medical Examination Checklist (CMEC) most recently in June 2020.

According to the Piper copilot's autopsy report, her cause of death was blunt trauma and her manner of death was accident. Her autopsy did not identify evidence of significant natural disease. Postmortem toxicological testing of specimens from the Piper copilot did not detect any tested-for substances that are generally considered impairing, and a postmortem vitreous chemistry test was generally unremarkable.

### **3.0 Cessna Flight Instructor**

The 40-year-old male Cessna CFI's last aviation medical examination was August 6, 2021. At that time, he reported no medication use or active medical conditions. No significant issues were identified, and he was issued a first-class medical certificate limited by a requirement to wear corrective lenses.

According to the Cessna CFI's autopsy report, his cause of death was blunt trauma and his manner of death was accident. Diffuse thermal injury was present. Both ventricles of the Cessna CFI's heart were described as dilated. The remainder of the heart examination, including of the coronary arteries, did not identify other evidence of natural disease. Hydronephrosis of the left kidney was present, with stones in the renal pelvis of the left kidney; the right kidney and bladder were unremarkable and the bladder contained abundant urine. The remainder of the autopsy did not identify other significant natural disease.

Postmortem toxicological testing of specimens from the Cessna CFI did not detect any tested-for substances that are generally considered impairing. A vitreous chemistry test showed an elevated vitreous creatinine and vitreous potassium, with normal vitreous urea nitrogen.

### **4.0 Cessna Student Pilot**

The 47-year-old male Cessna student pilot's only aviation medical examination was October 16, 2020. At that time, he reported using a testosterone replacement injection. He reported a history of a 2011 driving under the influence (DUI) arrest without a conviction. No significant issues were identified, and he was issued a third-class medical certificate without limitation. In June 2021, the FAA issued him a Letter of Eligibility for his 2011 DUI arrest.

According to the Cessna student pilot's autopsy report, his cause of death was blunt trauma and his manner of death was accident. Diffuse thermal injury was present and structural evaluation of the brain was limited. The left anterior descending coronary artery was 50% narrowed by plaque. The heart weight was elevated and the ventricles of the heart were described as dilated. The remainder of

the autopsy, including visual examination of the heart, was without other evidence of significant natural disease.

Postmortem toxicological testing of specimens from the Cessna student pilot did not detect any tested-for substances that are generally considered impairing. A vitreous chemistry test was interpreted by the medical examiner to indicate hyponatremic dehydration.

Submitted by:

Turan Kayagil, MD, FACEP  
Medical Officer