Aviation Investigation Final Report

Location:	Cleburne, Texas	**Accident Number:**	CEN23FA057
Date & Time:	December 4, 2022, 20:56 Local	**Registration:**	N8149Z
Aircraft:	Cessna 210-5(205)	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot, who held a commercial rating, and passenger, who held an airline transport pilot (ATP) rating, departed in the morning on a multi-leg personal flight. They accumulated about 8.5 hours of flight time that day, having stopped at 2 en route airports for fuel. Their final landing, which occurred in the evening after dark, was at an airport located about 21 miles from their destination. The pilots communicated to the airplane owner that they had stopped for additional fuel in the event of a missed approach at their final destination.

Before takeoff, they received an instrument flight rules (IFR) clearance, which consisted of an assigned heading of 090 and a climb to 3,000 ft above mean sea level (msl). The airplane departed and no further communications from the pilots was recorded by air traffic control.

ADS-B data indicated that after departure, the airplane climbed to 1,775 ft msl and began a right turn, which was opposite the direction of their destination. After turning about 90°, the airplane made a rapid descending right turn, and the recorded data showed the airplane at 1,275 ft msl (505 ft above ground level [agl]). The airplane continued to descend until it impacted a vacant construction site in a right-wing-low orientation. The airplane came to rest about 80 ft from the initial impact point. A postimpact fire consumed most of the wreckage.

Nearby surveillance video captured audio of the airplane's departure and both audio and video of the accident sequence. During the video, no abnormal engine sounds were heard. A witness located near the accident location stated that the airplane appeared to be at a "low altitude, right-hand bank at a high rate of speed" just before the impact. He stated that the engine sounded as if it was operating at a high power setting. The airplane impacted a vacant construction site and a postimpact fire consumed a majority of the wreckage.

At the time of the accident, the departure airport was reporting instrument meteorological conditions (IMC) with an overcast ceiling at 300 ft and visibility of 2.5 statute miles. Astronomical twilight had ended at 1851, about two hours before the accident, with night instrument conditions prevailing at the time of departure Conditions were cloudy from about 1,300 ft through 4,200 ft agl.

Although the postaccident examination of the airframe and engine was limited due to the significant impact and fire damage, the examination revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation. The airplane's flight instruments and avionics were destroyed during the accident and were unable to be functionally tested. The investigation was unable to determine which pilot was manipulating the flight controls at the time of the accident.

An aircraft performance study showed that the airplane tracked the extended centerline of the runway then began a right turn. About 20 seconds later, the airplane was descending rapidly, the airspeed was increasing through 140 kts, the pitch angle was decreasing past -10°, and the roll angle was increasing past 60°. The descent rate exceeded 11,000 ft/min. The total calculated energy showed a steady increase over the course of the flight consistent with the engine operating at a high power setting.

The rapid descent after the initial right turn was consistent with the pilot experiencing spatial disorientation in night instrument conditions, which resulted in a loss of control and high-speed impact with terrain. Given the long day of flying, and the night instrument conditions encountered during departure, it is likely that the pilot experienced spatial disorientation and lost control of the airplane.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

An in-flight loss of control as a result of spatial disorientation in night instrument meteorological conditions.

Findings

Personnel issues	Spatial disorientation - Pilot
Aircraft	(general) - Not attained/maintained
Environmental issues	Dark - Effect on operation
Environmental issues	Low visibility - Effect on operation

Factual Information

History of Flight

Initial climb	Loss of control in flight (Defining event)

On December 4, 2022, about 2056 central standard time (CST), a Cessna 210-5 airplane, N8149Z, was destroyed when it was involved in an accident near Cleburne, Texas. Both pilots were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations (CFR)* Part 91 personal flight.

The airplane departed Fairmont Municipal Airport, Fairmont, West Virginia, about 1016 (all times converted to CST), en route to a planned final destination of Granbury Regional Airport (GDJ), Granbury, Texas. Recorded ADS-B data revealed that the airplane landed at Upshur County Municipal Airport, Buckhannon, West Virginia, about 1033. Fueling records indicate that 41.49 gallons of fuel were purchased. The airplane departed about 1109 and returned to the airport about 1115. An additional 16.96 gallons of fuel were purchased. About 1133, the airplane departed again and flew to the Covington Municipal Airport, Covington, Tennessee, where it landed about 1527. About 1615, the airplane departed and landed at Cleburne Regional Airport (CPT), Cleburne, Texas, about 2022. While at CPT, the pilots communicated with the owner of the airplane and informed him that they had stopped for additional fuel to ensure they would have enough in the event of a missed approach at GDJ.

An IFR flight plan was filed for a flight from CPT to GDJ. The pilots subsequently received their IFR clearance from air traffic control, which consisted of an assigned heading of 090 and instruction to climb to 3,000 ft msl. They subsequently departed from CPT about 2055. No further communications from the crew were received by air traffic control.

Recorded ADS-B data indicated that after departure from runway 15, the airplane climbed to about 1,775 ft msl and began a right turn. After turning about 90°, a rapid descent began as the airplane continued the right turn. The last ADS-B data point was recorded when the airplane was about 1,275 ft msl (505 ft agl).

Surveillance video from about ¾ mile northeast of the accident location captured audio of the airplane's departure and both audio and video of the impact. During the video, no abnormal engine sounds were heard. A witness, located about 300 yards southeast of the accident location, stated that the airplane appeared to be at a "low altitude, right-hand bank at a high rate of speed" just before the impact. He stated that the engine sounded as if it was operating at a high power setting.

The airplane impacted a vacant construction site on a 340° ground track in a right-wing-low orientation. The initial point of impact was identified by remnants of the right navigation light lens and right wingtip. The airplane continued on the same track and the main wreckage was

located about 80 ft from the initial impact point, with the total debris field extending about 240 ft. During the impact sequence, the airplane was fragmented and was mostly consumed by fire.

A performance study was completed that showed the first ADS-B data point was recorded at 20:55:06, with the airplane near the midpoint of runway 15. The airplane reached an altitude where it would have entered the overcast ceiling about 20:55:35, and it continued to climb until it reached a maximum altitude of about 1,870 ft msl at 20:56:13. The airplane tracked the extended centerline of the runway until 20:56:00, when it began a right turn. By 20:56:20, the airplane was descending rapidly, the airspeed was increasing through 140 kts, the pitch angle was decreasing past -10°, and the roll angle was increasing past 60°. The calculated normal load factor increased, but did not exceed 2, and the longitudinal load factor remained near zero. The descent rate exceeded 11,000 ft/min, and the final ADS-B data point was recorded at 20:56:26.

Pilot Information

Certificate:	Commercial	**Age:**	35,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Instrument airplane; Instrument helicopter	**Toxicology Performed:**	
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	January 20, 2020
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	860 hours (Total, all aircraft)		

Pilot-rated passenger Information

Certificate:	Airline transport	**Age:**	30,Female
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	May 10, 2022
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	July 23, 2022
Flight Time:	(Estimated) 2320 hours (Total, all aircraft)		

The commercial pilot was listed as the pilot-in-command on the IFR flight plan for the accident flight.

Review of the commercial pilot's digital flight logbook showed 26.9 hours of night flying since October 18, 2016, 2.8 hours of actual instrument, and 0.4 hour of simulated instrument flight time.

Review of the ATP pilot's flight logbook showed no logged flights since May 17, 2022, in small, less than 12,500 lb max takeoff weight, single or multi-engine airplanes. Since May 2022, the ATP pilot had received initial training in an Embraer Phenom 300 for a Title 14 *CFR* Part 135 operator. Additionally, the pilot had 72.4 hours of night flying, 14.8 hours of actual instrument, and 73.8 hours of simulated instrument flight time.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N8149Z
Model/Series:	210-5(205)	**Aircraft Category:**	Airplane
Year of Manufacture:	1962	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	205-0149
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	November 22, 2022 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	4238 Hrs as of last inspection	**Engine Manufacturer:**	Continental Motors
ELT:	Installed, not activated	**Engine Model/Series:**	IO-550
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	KCPT,854 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	20:55 Local	**Direction from Accident Site:**	356°
Lowest Cloud Condition:		**Visibility**	2.5 miles
Lowest Ceiling:	Overcast / 300 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	160°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.1 inches Hg	**Temperature/Dew Point:**	10°C / 10°C
Precipitation and Obscuration:	Moderate - None - Mist		
Departure Point:	Cleburne, TX	**Type of Flight Plan Filed:**	IFR
Destination:	Granbury, TX (KGDJ)	**Type of Clearance:**	IFR
Departure Time:		**Type of Airspace:**	Class G

At 2035, the CPT AWOS reported a wind from 150° at 6 knots, visibility of 5 statute miles, mist, an overcast ceiling at 300 ft agl, a temperature of 10° Celsius (C) and dew point temperature of 10°C, and an altimeter setting of 30.10 inches of mercury (remarks indicated that it was an automated station without a precipitation discriminator).

At 2055, the CPT AWOS reported a wind from 160° at 7 knots, visibility of 2 1/2 statute miles, mist, an overcast ceiling at 300 ft agl, a temperature of 10° C and dew point temperature of 10°C, and an altimeter setting of 30.10 inches of mercury (remarks indicated that it was an automated station without a precipitation discriminator).

A High-Resolution Rapid Refresh (HRRR) model sounding for near the accident site at 2100, using an elevation of 763 ft, was retrieved from the National Oceanic and Atmospheric Administration's Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. Cloudy conditions were identified by RAOB in the lower atmosphere from about 1,300 ft through 4,200 ft agl. The wind nearest the surface was from the south-southeast about 5 kts, but the wind increased in magnitude to a southwest wind of about 30 kts near 2,800 ft agl. RAOB identified light low-level wind shear throughout most of a layer between about 800 and 2,200 ft agl. Light or moderate turbulence was noted between about 1,250 and 7,400 ft agl. Temperature inversions were noted between about 1,250 and 3,500 ft and between about 4,250 and 7,350 ft agl.

Airport Information

Airport:	CLEBURNE RGNL CPT	**Runway Surface Type:**	Asphalt
Airport Elevation:	854 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	15	**IFR Approach:**	None
Runway Length/Width:	5697 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	On-ground
Total Injuries:	2 Fatal	**Latitude, Longitude:**	32.323764,-97.431479

A postaccident examination confirmed flight control continuity from the cockpit to the rudder, elevator, and the left aileron through tension overload separations of the control cables. The right aileron control continuity was partially established with a small section of the direct cable not observed at the time of the examination. The breaks observed were consistent with tension overload and the right aileron cables remained attached to the bellcrank and control

chain. The engine was examined with a borescope with no pre-impact anomalies noted. The wing spar forward and aft attach points revealed no evidence of fatigue or corrosion. The vacuum pump revealed no preimpact anomalies. Extensive impact and fire damage precluded functional testing of the airplane systems.

Medical and Pathological Information

Pilot

The Office of the Chief Medical Examiner (OCME), Tarrant County Medical Examiner's District, performed the commercial pilot's autopsy. According to the autopsy report, the pilot's cause of death was blunt force injuries. The manner of death was accident. Due to the extent of injuries the brain was unavailable for examination and examination of heart and lungs was limited. Within these limitations, the autopsy did not identify evidence of significant natural disease.

The OCME performed toxicological testing of postmortem muscle of the commercial pilot. No tested-for substances were detected. The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem tissue specimens of the pilot. No tested-for substances were detected.

Pilot-rated passenger

The OCME, Tarrant County Medical Examiner's District, performed the airline transport pilot's autopsy. According to the autopsy report, the pilot's cause of death was blunt force injuries. The manner of death was accident. Autopsy evaluation for natural disease was limited by the extent of injuries. The brain was unavailable for examination. Within these limitations, the autopsy did not identify evidence of significant natural disease.

The OCME performed postmortem toxicological testing of cavity blood of the airline transport pilot. Diphenhydramine was detected at 58 ng/mL. No other tested-for substances were detected.

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem cavity blood, muscle, and liver tissue of the airline transport pilot. Quetiapine was detected in liver tissue at 17 ng/g but not in blood. Hydroxyzine was detected in liver tissue at 6 ng/g but not in blood. Diphenhydramine was detected in liver tissue at 17 ng/g and cavity blood at 57 ng/mL. Dextromethorphan and dextrophan were detected in liver tissue and cavity blood.

Quetiapine, sometimes marketed as Seroquel, is a prescription antipsychotic medication. In the United States, quetiapine is approved by the Food and Drug Administration (FDA) for treating schizophrenia. Quetiapine is also FDA-approved for treating acute episodes of mania and depression in bipolar disorder, and as part of chronic multi-drug treatment of bipolar disorder. Additionally, quetiapine is approved as part of multi-drug treatment of major depressive disorder. Quetiapine is regularly prescribed for off-label (non-FDA-approved) uses, including, in low doses, treatment of insomnia without an underlying psychiatric illness. Some other possible off-label uses include chronic single-drug treatment of bipolar disorder, as well treatment of post-traumatic stress disorder and anxiety. Quetiapine may also be misused or abused, often in combination with other recreational substances.

Quetiapine commonly causes drowsiness, especially in the initial days after starting a treatment regimen; users may develop tolerance to this effect over time. Quetiapine typically carries a warning that it has the potential to impair judgment, thinking, and motor skills, and that users should be cautioned about performing activities requiring mental alertness, such as operating a motor vehicle or hazardous machinery, until they are reasonably certain that the drug does not affect them adversely. The FAA considers quetiapine to be a “Do Not Issue/Do Not Fly” medication. According to the FAA medical case review for this accident, quetiapine is unacceptable for FAA medical certification.

Hydroxyzine is a prescription medication that can be used to treat anxiety, as well as pruritis (itching) due to allergies. Hydroxyzine usually carries a warning that users may experience drowsiness and should use caution when driving a motor vehicle or operating machinery. Caution is advised in using hydroxyzine and diphenhydramine at the same time as severe adverse drug reactions can occur. These include severe cardiac rhythm abnormalities, increased drowsiness, dry mouth, and confusion. The FAA states that anti-anxiety medications are “Do Not Issue/Do Not Fly” medications both for their sedating effects and the potentially underlying conditions being treated.

Diphenhydramine is a sedating antihistamine medication widely available over the counter in multiple sleep aids and cold and allergy products. Diphenhydramine can cause drowsiness, decrease reaction time, and impair attention and memory. It often carries a warning that caution should be taken when performing tasks such as driving and operating machinery. The FAA states that pilots should not fly within 60 hours of using diphenhydramine, to allow time for it to be cleared from circulation.

Dextromethorphan is an over-the-counter cough suppressant found in numerous common cough syrups and cold medications. Dextromethorphan is not typically impairing at levels associated with medicinal use. The FAA states that pilots should not fly after using dextromethorphan until at least five dosage intervals have elapsed, to allow time for the drug to be cleared from circulation. Dextrorphan is a metabolite of dextromethorphan.

Preventing Similar Accidents

Reduced Visual References Require Vigilance (SA-020)

The Problem

About two-thirds of general aviation accidents that occur in reduced visibility weather conditions are fatal. The accidents can involve pilot spatial disorientation or controlled flight into terrain. Even in visual weather conditions, flights at night over areas with limited ground lighting (which provides few visual ground references) can be challenging.

What can you do?

- Obtain an official preflight weather briefing, and use all appropriate sources of weather information to make timely in-flight decisions. Other weather sources and in-cockpit weather equipment can supplement official information.
- Refuse to allow external pressures, such as the desire to save time or money or the fear of disappointing passengers, to influence you to attempt or continue a flight in conditions in which you are not comfortable.
- Be honest with yourself about your skill limitations. Plan ahead with cancellation or diversion alternatives. Brief passengers about the alternatives before the flight.
- Seek training to ensure that you are proficient and fully understand the features and limitations of the equipment in your aircraft, particularly how to use all features of the avionics, autopilot systems, and weather information resources.
- Don’t allow a situation to become dangerous before deciding to act. Be honest with air traffic controllers about your situation, and explain it to them if you need help.
- Remember that, when flying at night, even visual weather conditions can be challenging. Remote areas with limited ground lighting provide limited visual references cues for pilots, which can be disorienting or render rising terrain visually imperceptible. When planning a night VFR flight, use topographic references to familiarize yourself with surrounding terrain. Consider following instrument procedures if you are instrument rated or avoiding areas with limited ground lighting (such as remote or mountainous areas) if you are not.
- Manage distractions: Many accidents result when a pilot is distracted momentarily from the primary task of flying.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-020.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA Regulations (FARs).

Administrative Information

Investigator In Charge (IIC):	Williams, David
Additional Participating Persons:	Kevin Taylor; FAA; Irving, TX Kurt Gibson; Textron Aviation; Wichita, KS Soderlund, Henry; Textron Aviation; Wichita, KS
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