



Aviation Investigation Final Report

Location:	Atlanta, Georgia	Accident Number:	ERA19FA071
Date & Time:	December 20, 2018, 12:10 Local	Registration:	N188CW
Aircraft:	Cessna 560	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot departed on an instrument flight rules flight into instrument meteorological conditions (IMC). Radar data indicated that the airplane entered a left turn after takeoff, consistent with the pilot's instrument clearance. As the airplane climbed to an altitude about 2,410 ft above ground level, its rate of climb increased from about 3,500 ft per minute to 9,600 ft per minute, the stick shaker activated, and the airplane decelerated to about 75 knots. The airplane then entered a descending right turn and rolled inverted before impacting terrain about 1 mile from the airport. All major components of the airplane were located at the accident site, and examination of the wreckage revealed no anomalies with the airplane that would have precluded normal operation.

The weather conditions about the time of the accident included an overcast cloud ceiling about 600 ft above ground level. It is likely that the pilot became spatially disoriented after entering the cloud layer, which resulted in the airplane's high rate of climb, rapid loss of airspeed, and a likely aerodynamic stall. The steep descending right turn, the airplane's roll to an inverted attitude, and the high-energy impact are also consistent with a loss of control due to spatial disorientation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's loss of airplane control due to spatial disorientation during initial climb in instrument meteorological conditions.

Findings

Personnel issues	Spatial disorientation - Pilot
Aircraft	Directional control - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Environmental issues	Below VFR minima - Contributed to outcome

Factual Information

History of Flight

Initial climb	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On December 20, 2018, about 1210 eastern standard time, a Cessna 560, N188CW, was destroyed when it was involved in an accident in Atlanta, Georgia. The airline transport pilot and three passengers were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

A review of air traffic control data revealed that the local ground controller cleared the pilot for takeoff from runway 8 at Fulton County Airport Brown Field (FTY) and instructed him to turn left to a heading of 310°. Shortly thereafter, a cockpit voice recorder (CVR) that was onboard recorded increased engine sound and the pilot state "airspeed alive." Radar data provided by the Federal Aviation Administration (FAA) revealed that the airplane departed from runway 8, while climbing about 3,500 ft per minute. The airplane then began a turn left toward the north climbing to about 3,250 ft msl (2,410 ft agl), reaching a maximum rate of climb about 9,600 ft per minute and decelerating to about 75 knots. Thirty-four seconds after the engine sound increased, the CVR recorded engine sound decreasing. Two "beeps" sounded within 9 seconds of each other after the engine sound decreased, and 3 seconds after the second beep, a sound similar to the stick shaker could be heard. After that, a grunt and heavy breathing could be heard, followed by the sound of the stick shaker and another beep. Finally, an electronic voice stated "sink rate" then "pull up" was announced four times before the sound of impact. Radar data indicated that the airplane entered a descending right 180° turn before radar contact was lost at an altitude of about 1,175 ft msl (335 ft agl).

Video obtained from a security camera positioned on top of a building about 1/2 mile from the accident site captured the airplane descending in a left turn before it rolled inverted and disappeared from view behind trees; fire and smoke appeared shortly thereafter.

Pilot Information

Certificate:	Airline transport	Age:	47,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Unknown
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	May 1, 2018
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	2300 hours (Total, all aircraft), 110.5 hours (Total, this make and model)		

According to the pilot's training records, he satisfactorily completed a 4-day Citation V Single Pilot Exemption course on October 21, 2018, during which he accumulated 12 hours of simulator time. Of the 12 hours, 8.7 hours were counted as instrument experience. On the first day of training, the instructor noted that the pilot needed "to review stall series and practice on steep turns and also duties of a single pilot, using the available resources in the cockpit as a part of CRM [crew resource management] for single pilot operation." On the third day of training, the instructor noted, "overall improvement in all areas of single pilot operation…still needs some more [simulator] time to reach the level of proficiency that is required for single pilot exemption."

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N188CW
Model/Series:	560 No Series	Aircraft Category:	Airplane
Year of Manufacture:	1991	Amateur Built:	
Airworthiness Certificate:	Transport	Serial Number:	560-0148
Landing Gear Type:	Retractable - Tricycle	Seats:	11
Date/Type of Last Inspection:	Continuous airworthiness	Certified Max Gross Wt.:	16100 lbs
Time Since Last Inspection:		Engines:	2 Turbo fan
Airframe Total Time:	6854.2 Hrs	Engine Manufacturer:	Pratt & Whitney Canada
ELT:	Installed	Engine Model/Series:	JT15D-5A
Registered Owner:		Rated Power:	2900 Lbs thrust
Operator:		Operating Certificate(s) Held:	None

The airplane was maintained under a continuous airworthiness inspection program.

A pilot who flew the airplane on the evening before the accident reported that there were no anomalies with the airplane during that flight.

According to the airplane operating manual, depending on the weight of the airplane the stall speed in a level bank angle could be between 81 and 95 knots.

The airplane was equipped with a stall warning system. According to the operating manual, the "stall warning is achieved by the use of a stick shaker mounted on the forward side of the pilot's control column...the pilot is alerted to impending stall by the vibration of the control column which occurs approximately 8% to 10% above the actual stall speed. Stick shaker activation will occur before stall buffet, except in the clean configuration where they are nearly the same and either could occur first."

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Day
Observation Facility, Elevation:	FTY, 840 ft msl	Distance from Accident Site:	1 Nautical Miles
Observation Time:	12:16 Local	Direction from Accident Site:	242°
Lowest Cloud Condition:		Visibility	7 miles
Lowest Ceiling:	Overcast / 600 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	50°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.52 inches Hg	Temperature/Dew Point:	8°C / 8°C
Precipitation and Obscuration:	Light - None - Rain		
Departure Point:	Atlanta, GA (FTY)	Type of Flight Plan Filed:	IFR
Destination:	Millington, TN (MQA)	Type of Clearance:	IFR
Departure Time:	12:00 Local	Type of Airspace:	

The 1216 recorded weather observation at FTY, about 1 mile southwest of the accident location, included wind from 050° at 10 knots, 7 miles visibility, light rain, overcast clouds at 600 ft agl, temperature 8°C, dew point 8°C, and an altimeter setting of 29.52 inches of mercury.

The Geostationary Operational Environmental Satellite number 16 (GOES-16) visible and infrared data revealed an extensive layer of cloud cover over the accident site moving from southwest to northeast.

The Atlanta Center Weather Service Unit issued a Center Weather Advisory at 1056, which was valid until 1255 for the accident area. The advisory warned of areas of occasional low instrument flight rules ceilings below 500 ft agl and occasional visibilities below 2 miles in rain and fog, with conditions expected to continue beyond the end of the period.

AIRMET advisories Sierra and Tango were valid for the accident site at the accident time. The AIRMETs warned of moderate turbulence below 18,000 ft msl and instrument flight rules (IFR) and mountain obscuration conditions due to clouds, precipitation, and mist.

FTY issued a Terminal Aerodrome Forecast valid at the time of the accident that expected wind from 070° at 10 knots, 3 miles visibility, moderate rain showers, and an overcast ceiling at 700 ft agl between 1100 and 2200.

The pilot did not request a weather briefing through Leidos Flight Service, nor did he review or request any weather information from ForeFlight on the day of the accident. The pilot did check weather information on the day before the accident via ForeFlight for other flight routes flown that day.

Airport Information

Airport:	Fulton County Airport-Brown Fi FTY	Runway Surface Type:	Asphalt
Airport Elevation:	841 ft msl	Runway Surface Condition:	
Runway Used:	08	IFR Approach:	None
Runway Length/Width:	5797 ft / 100 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	3 Fatal	Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 Fatal	Latitude, Longitude:	33.790554,-84.495002

The airplane impacted a tree before impacting a field about 50 ft beyond the initial tree strike. All major components of the airplane were located in the vicinity of the main wreckage. The debris path was about 325 ft long and was oriented on a 142° heading.

The airplane was highly fragmented along the debris path. The forward wing spar was separated from the airframe and came to rest about 200 ft from the initial ground impact point. The empennage was impact separated and located about 275 ft from the initial impact crater. Both engines were impact separated from the airplane. The cockpit, cabin, and wings were highly fragmented and destroyed. Control continuity was not confirmed due to the fragmentation of the wreckage and multiple breaks in the control cables and bellcranks, but all fractures appeared consistent with overload failure.

The attitude indicator was located and indicated that the airplane was in an inverted attitude at the time of impact. Disassembly revealed rotational scoring on both the gyro and the gyro housing. The standby attitude indicator was removed and disassembled. Rotational scoring was noted on the housing and the gyro.

The engines were shipped to the manufacturer's facility for further examination. The forward section of

the left engine was impact damaged and several of the fan blades were impact separated. The left engine exhaust case was removed and rotational scoring was noted on the trailing edge of the third stage low turbine. Rotational scoring was also noted on the second stage shroud of the left engine. Debris and dirt were noted on the inside of the engine near the third stage turbine. The low turbine shaft was separated and exhibited a torsional fracture.

Examination of the right engine revealed that all fan blades were bent opposite the direction of rotation. Several blades exhibited leading edge gouging and one blade was impact separated. The exhaust case was removed to access the hot section of the engine. The low-pressure turbine could be rotated by hand and debris was noted on the blades. Scoring was noted on the trailing edge of the third stage turbine blades. The low turbine shaft was separated from the forward section of the engine and exhibited a torsional fracture.

Additional Information

Spatial Disorientation

The FAA Civil Aeromedical Institute's publication, "Introduction to Aviation Physiology," defines spatial disorientation as a loss of proper bearings or a state of mental confusion as to position, location, or movement relative to the position of the earth. Factors contributing to spatial disorientation include changes in acceleration, flight in instrument meteorological conditions (IMC), frequent transfer between visual meteorological conditions (VMC) and IMC, and unperceived changes in aircraft attitude.

The FAA Airplane Flying Handbook (FAA-H-8083-B) stated:

The pilot must believe what the flight instruments show about the airplane's attitude regardless of what the natural senses tell. The vestibular sense (motion sensing by the inner ear) can and will confuse the pilot. Because of inertia, the sensory areas of the inner ear cannot detect slight changes in airplane attitude, nor can they accurately send the attitude changes which occur at a uniform rate over a period of time. On the other hand, false sensations are often generated, leading the pilot to believe the attitude of the airplane has changed when, in fact, it has not. These false sensations result in the pilot experiencing spatial disorientation.

Medical and Pathological Information

The Office of the Medical Examiner, Atlanta, Georgia, performed the autopsy on the pilot. The autopsy report indicated the cause of death was multiple blunt force injuries.

Toxicology testing performed by the FAA Forensic Sciences Laboratory on the pilot's kidney and muscle tissue detected the non-sedating cough suppressant dextromethorphan, its metabolite dextrorphan, and the non-sedating expectorant guaifenesin. Kidney, muscle, and lung tissue were positive for ethanol at 0.752 grams per hectogram (gm/hg), 0.133 gm/hg, and 0.021 gm/hg, respectively. N-propanol was also detected in kidney tissue. Tissue samples were reported as exhibiting putrefaction,

thus, the ethanol was likely produced postmortem.

Administrative Information

Investigator In Charge (IIC):	Kemner, Heidi
Additional Participating Persons:	Andre T Cummings; FAA/FSDO; Atlanta, GA Jennifer Barclay; Textron Aviation; Wichita, KS
Original Publish Date:	July 13, 2020
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=98793

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