Aviation Investigation Final Report

Location:	Coleman, Texas	**Accident Number:**	CEN20FA093
Date & Time:	February 20, 2020, 06:00 Local	**Registration:**	N860J
Aircraft:	Beech 200	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot and two passengers departed on an instrument flight rules cross-country flight in night instrument meteorological conditions (IMC).

The pilot was instructed by air traffic control to climb to 12,000 ft, and then cleared to climb to FL230. The pilot reported to the controller that the airplane encountered freezing drizzle and light rime icing during the climb from 6,500 ft to 8,000 ft mean sea level (msl).

As the airplane climbed through 11,600 ft msl, the pilot reported that they had an issue with faulty deicing equipment and needed to return to the airport. The controller instructed the pilot to descend and cleared the airplane back to the airport. When asked by the controller if there was an emergency, the pilot stated that they “blew a breaker,” and were unable to reset it.

As the controller descended the airplane toward the airport, the pilot reported that they were having issues with faulty instruments. At this time, the airplane was at an altitude of about 4,700 ft. The controller instructed the pilot to maintain 5,000 ft, and the pilot responded that he was “pulling up.” There was no further communication with the pilot.

Review of the airplane’s radar track showed the airplane’s departure from the airport and the subsequent turn and southeast track toward its destination. The track appeared as a straight line before a descending, right turn was observed. The turn radius decreased before the flight track ended.

The airplane impacted terrain in a right-wing-low attitude. The wreckage was scattered and highly fragmented along a path that continued for about 570 ft.

Examination of the wreckage noted various pieces of the flight control surfaces and cables in the wreckage path. Control continuity could not be established due the fragmentation of the wreckage;

however, no preimpact anomalies were found. Examination of the left and right engines found rotational signatures and did not identify any pre-impact anomalies.

A review of maintenance records noted two discrepancies with the propeller deice and surface deice circuit breakers, which were addressed by maintenance personnel. Impact damage and fragmentation prevented determination of which circuit breaker(s) the pilot was having issues with or an examination of any deicing systems on the airplane. The radio transmissions and transponder returns reflected in the radar data indicate that the airplane's electrical system was operational before the accident.

It is likely that the pilot's communications with the controller and attempted troubleshooting of the circuit breakers introduced distractions from his primary task of monitoring the flight instruments while in IMC.

Such interruptions would make him vulnerable to misleading vestibular cues that could adversely affect his ability to effectively interpret the instruments and maintain control of the airplane. The pilot's report of "faulty instruments" during a decreasing radius turn and his initial distraction with the circuit breakers and radio communications is consistent with the effects of 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. Contributing to the accident was the pilot's distraction with a "popped" circuit breaker and communications with air traffic control.

Findings

Personnel issues	Spatial disorientation - Pilot
Personnel issues	Monitoring equip/instruments - Pilot

Factual Information

History of Flight

Enroute-climb to cruise	Electrical system malf/failure
Enroute	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On February 20, 2020, about 0600 central standard time, a Beechcraft B200 airplane, N860J, was destroyed when it was involved in an accident near Lake Coleman, Texas. The pilot and two passengers were fatally injured. The flight was conducted as a Title 14 *Code of Federal Regulations Part 91* personal flight.

A review of air traffic control communications revealed that the airplane was cleared for takeoff from Runway 35L at Abilene Regional Airport (ABI), Texas. Shortly after, the pilot was instructed to climb to 12,000 ft mean sea level (msl), then cleared to climb to 23,000 ft msl.

The pilot reported to the controller that they encountered freezing drizzle and light rime icing during the climb from 6500 ft to 8,000 ft msl.

As the airplane climbed through 11,600 ft msl, the pilot reported that they were having an issue with faulty deicing equipment and needed to return to the airport. The controller instructed the pilot to descend to 11,000 ft msl and cleared them direct to the ABI. The controller then issued a descent to 7,000 ft and asked if there was an emergency. The pilot stated that they "blew a breaker" when they encountered icing conditions, and that it was not resetting.

The controller then instructed the pilot to descend to 5,000 ft and to expect the ILS Runway 35R approach. The controller gave the pilot a heading of 310°. Shortly afterwards the controller asked the pilot if they were turning to the assigned heading; the pilot responded that they were having issues with faulty instruments. When the controller asked the aircraft to report their altitude, the pilot reported that they were at 4,700 ft. The controller then instructed the pilot to maintain 5,000 ft. The pilot responded he was "pulling up". There was no further communication with the pilot.

Review of the airplane's radar track showed the airplane's departure from ABI and the subsequent turn and southeast track towards its destination. The track appeared as a straight line before a right turn was observed. The turn radius decreased before the flight track ended.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	31
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
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:**	November 27, 2019
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	5300 hours (Total, all aircraft)		

On the pilot's second-class medical application dated November 27, 2019, the pilot listed 5,300 total flight hours and 150 hours in the last six months. The pilot had completed a FlightSafety International KingAir 90, Part 135 initial/transition training course on March 3, 2019. At that time, the pilot had 625 total flight hours in the KingAir 200.

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N860J
Model/Series:	200	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	BB-1067
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	August 24, 2019 AAIP	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	2 Turbo prop
Airframe Total Time:	as of last inspection	**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	PT6A-42
Registered Owner:		**Rated Power:**	
Operator:		**Operating Certificate(s) Held:**	None

A review of the airplane maintenance records revealed two discrepancies regarding circuit breakers. The discrepancies noted, "Prop deice inop breaker popped" and "surface deice breaker popped." The maintenance entry, dated January 2020, annotated the corrective action as, "Checked associated wiring

at LH and RH prop. Torqued hardware on heater boot terminal blocks. Checked wiring at LH and RH de ice boots. Ground run ops check ok" and "Tested system on ground using airborne test kit. Ground run ops check ok."

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Not reported
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 900 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	40°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.34 inches Hg	**Temperature/Dew Point:**	5°C / 5°C
Precipitation and Obscuration:			
Departure Point:	Abilene, TX (KABI)	**Type of Flight Plan Filed:**	IFR
Destination:	Harlingen, TX (KHRL)	**Type of Clearance:**	IFR
Departure Time:		**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Fatal	**Aircraft Fire:**	Unknown
Ground Injuries:		**Aircraft Explosion:**	Unknown
Total Injuries:	3 Fatal	**Latitude, Longitude:**	32.050834,-99.569999(est)

The airplane impacted terrain in a right-wing-low attitude. The wreckage path was oriented on a magnetic heading of 320° and continued for about 570 ft. The wreckage was highly fragmented along the wreckage path. There was a strong fuel odor at the site.

Figure 1: Wreckage path with fragmented wreckage

Various parts of the flight controls were located along the wreckage path. A section of the empennage wreckage contained the rudder, which remained attached; the left and right elevators which also remained attached. The counterweighed tips had impact separated and were located in the debris path. Various pieces of the flight control cables were found in the wreckage path, and continuity could not be established due the fragmentation of the wreckage. Multiple pieces of both the left and right ailerons were located among the wreckage.

The damaged left inboard and outboard flap were in the wreckage. The right inboard and outboard flap separated into multiple sections and located in the debris path. Left outboard and inboard flap actuator housings were fractured and/or had separation of the flap drive cable. The right inboard actuator measurement equated to flaps 0 ° (flaps retracted).

Various landing gear components were located in the wreckage path, including the initial ground scar; the position of the landing gear before impact could not be determined.

Each engine was equipped with an MT composite, 5-bladed propeller under a supplemental type certificate, multiple fragments/pieces of the blades were located in the debris path.

Both engines were either buried or partially buried in the ground, just beyond the initial wing impact point. The right-side engine sustained heavy impact damage: the engine case, accessory gear box, exhaust ducts were crushed, deformed, or fragmented. Disassembly of the engine was conducted in the field; examination of the compressor turbine showed circumferential rubbing wear at the disc and blade firtree serration area from contact with the pressure turbine (1st stage) vane ring. The compressor turbine disc downstream side center bore, and lugs showed rubbing wear from contact with the interstage baffle. The compressor turbine shroud segments showed circumferential rubbing wear and corresponding rubbing wear was observed on the compressor turbine blade tips. A visual examination of the 1st stage compressor rotor showed several airfoils were bent in the opposite direction of rotation with material observed on the blade tips. The 1st stage compressor rotor airfoils showed impact marks on the leading edge.

The left engine was located slightly further along the debris path. The exhaust ducts were still attached to the engine and were crushed, deformed, and folded over the engine exhaust case. The engine also displayed heavy impact damage. Disassembly of the left engine was conducted in the field; examination of the compressor turbine disc found it was fractured at the compressor rear air seal area and released from the compressor. Circumferential rubbing wear was observed on the compressor disc upstream side from contact with the compressor turbine vane ring. The downstream side of the compressor turbine disc showed circumferential rubbing wear across the entire disc face from contact with the 1st stage power turbine vane ring and interstage baffle. The compressor turbine blades were fractured and showed secondary impact damage. The fracture surfaces showed evidence of tensile overload. The compressor turbine shroud segments showed circumferential scoring. The corresponding portion of the fracture compressor turbine disc remained inside the engine. The compressor turbine vane ring airfoils showed debris, otherwise no pre-impact distress was observed.

The power turbine stator housing was fractured, deformed, and mangled due to impact. The 1st stage power turbine vane ring was fragmented. The interstage baffle was deformed and wrapped around the 1st stage power turbine disc. The power turbine (1st stage) disc upstream side showed circumferential

rubbing wear from contact with the interstage baffle. The 1st stage power turbine blades were all fractured and the fracture surface showed evidence of tensile overload. The 2nd stage power turbine vane ring was deformed, and several airfoils were bent and fractured. The 2nd stage power turbine disc downstream side showed circumferential rubbing wear from contact with the exhaust case. The 2nd stage power turbine blades were all fractured at various heights and the fracture surfaces showed evidence of tensile overload.

The left and right engine examinations did not identify any pre-impact abnormalities.

Figure 2: Initial impact point and Engines

The instrument panel was highly fragmented, with pieces of instruments scattered along the wreckage path. Due to the impact damage, instrument readings and the position of switches and levers in the cockpit were not considered reliable. The right-side pneumatic attitude indicator was located; the instrument had impact separated from the panel and displayed heavy impact damage. The rotor/gyro was outside of the case; light circumferential scoring/rubbing was noted. A remote gyro unit was in the debris path. The unit also had heavy impact damage with circumferential scoring/rubbing on the rotor/gyro system.

Additional Information

Figure 3: N860J panel

Excerpt from: Pilot's Handbook of Aeronautical Knowledge FAA H-8083-25B Spatial Disorientation pilot handbook 17-6

Spatial Disorientation and Illusions

Spatial disorientation specifically refers to the lack of orientation with regard to the position, attitude, or movement of the airplane in space. The body uses three integrated systems that work together to ascertain orientation and movement in space.

- Vestibular system—organs found in the inner ear that sense position by the way we are balanced
- Somatosensory system—nerves in the skin, muscles, and joints that, along with hearing, sense position based on gravity, feeling, and sound
- Visual system—eyes, which sense position based on what is seen

All this information comes together in the brain and, most of the time, the three streams of information agree, giving a clear idea of where and how the body is moving. Flying can sometimes cause these systems to supply conflicting information to the brain, which can lead to disorientation. During flight in visual meteorological conditions (VMC), the eyes are the major orientation source and usually prevail over false sensations from other sensory systems. When these visual cues are removed, as they are in instrument meteorological conditions (IMC), false sensations can cause a pilot to quickly become disoriented.

Graveyard Spiral

As in other illusions, a pilot in a prolonged coordinated, constant-rate turn may experience the illusion of not turning. During the recovery to level flight, the pilot will then experience the sensation of turning in the opposite direction causing the disoriented pilot to return the aircraft to its original turn. Because an aircraft tends to lose altitude in turns unless the pilot compensates for the loss in lift, the pilot may notice a loss of altitude. The absence of any sensation of turning creates the illusion of being in a level descent. The pilot may pull back on the controls in an attempt to climb or stop the descent. This action tightens the spiral and increases the loss of altitude; this illusion is referred to as a "graveyard spiral." This may lead to a loss of aircraft control.

Medical and Pathological Information

The South Plains Forensic Pathology, PA. Lubbock, Texas, under the authority of the Justice of the Peace, Coleman County, conducted an autopsy on the pilot. The cause of death was determined to be: "multiple blunt impact injuries".

The Federal Aviation Administration's (FAA) Forensic Sciences Laboratory, Oklahoma City, Oklahoma, conducted toxicological testing on the pilot. The tests were negative for ethanol. The test was positive for diphenhydramine.

Diphenhydramine is used in over-the-counter medicines and is commonly used to treat sneezing, runny nose, watery eyes, hives, skin rash, itching, and other cold or allergy symptoms.

Administrative Information

Investigator In Charge (IIC):	Hatch, Craig		
Additional Participating Persons:	Anthony Leinneweber; FAA FSDO; Lubbock, TX Jennifer Barclay; Textron Aviation ; Wichita, KS Robert Duma; P&W Canada; Quebec		
Original Publish Date:	March 11, 2022	**Investigation Class:**	3
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=100971		