Aviation Investigation Final Report

Location:	Poolville, Texas	**Accident Number:**	CEN19FA004
Date & Time:	October 12, 2018, 16:08 Local	**Registration:**	N221MC
Aircraft:	Piper PA32RT	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot and passenger departed on the cross-county flight in visual meteorological conditions. Automatic dependent surveillance-broadcast (ADS-B) and GPS data indicated that, after takeoff, the airplane proceeded east and that, for most of the flight, flew at altitudes that were between 8,500 and 9,500 ft mean sea level (msl). However, as the flight progressed, the weather conditions deteriorated. Toward the end of the flight, the airplane began descending from 9,000 ft msl at a descent rate of about 700 ft per minute. The airplane then entered a descending right turn with a decreasing radius before the ADS-B and GPS data ended. The radius of the turn was initially about 4,000 ft and decreased during the next minute to about 1,000 ft by the final 1 second of the data. As the airplane continued to turn, the descent rate increased; the average rate of descent of the airplane for the final 10 seconds of the recorded ADS-B data was about 12,900 ft per minute.

The airplane wreckage was distributed over a large area with airframe parts located 3,600 ft from the main wreckage location and lighter-weight items from within the airplane located more than 1 mile away. The wreckage distribution indicated that the airplane broke apart during flight and before contacting the ground. Examination of the airframe and engine revealed no anomalies consistent with a prebreakup failure or malfunction.

Weather data indicated that marginal visual flight rules conditions prevailed across the area with ceilings overcast from 2,500 to 3,000 ft agl. Several weather stations immediately north and north-northeast of the accident site reported instrument flight rules (IFR) conditions to low IFR conditions, indicating ceilings of less than 1,000 ft agl and/or visibilities of less than 3 miles. No breaks in the overcast layer of clouds were reported surrounding the time of the accident, so the pilot's visual flight into IMC would have been conducive to the development of spatial disorientation.

The pilot held an instrument rating, but a review of his flight logbook revealed that he had logged a total of only 2.3 hours of actual instrument flight experience, including 0.2 hour during the 3 months preceding the accident. As a result, the pilot did not likely possess the experience or recency to adequately control the airplane through the use of the instruments in IFR conditions. Thus, it is likely

that the pilot experienced spatial disorientation during an encounter with IMC, which progressed into a graveyard spiral (as indicated by the tightening of the turn) and a subsequent loss of control.

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 as a result of spatial disorientation and the exceedance of the structural capabilities of the airplane. Contributing to the accident was the pilot's limited experience in instrument conditions.

Findings

Personnel issues	Spatial disorientation - Pilot
Aircraft	(general) - Not attained/maintained
Aircraft	(general) - Capability exceeded

Factual Information

History of Flight

Enroute-descent	Loss of control in flight (Defining event)
Uncontrolled descent	Aircraft structural failure

On October 12, 2018, about 1608 central daylight time (CDT), a Piper PA-32RT-300, N221MC, was destroyed when it was involved in an accident near Poolville, Texas. The pilot and passenger were fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight. Marginal visual meteorological conditions prevailed for the flight.

The flight originated from the Sierra Blanca Regional Airport (SRR), Ruidoso, New Mexico, about 1325 CDT and was destined for Hicks Airfield (T67), Fort Worth, Texas. Automatic dependent surveillance-broadcast (ADS-B) data from the Federal Aviation Administration (FAA) and GPS data from the airplane's Garmin 696 GPS receiver showed that the airplane was on a straight ground track and at a cruise altitude between about 8,500 and 9,500 ft mean sea level (msl) for most of the flight. About 1605 the airplane began descending from 9,000 ft msl. During the next 2 minutes, the airplane remained on a straight ground track at an average descent rate of 700 ft per minute. The airplane then entered a descending right turn with a decreasing radius, as shown in the figure; the radius of the turn was initially about 4,000 ft, which decreased during the next minute to about 1,000 ft in the final 1 second of data. Also, as the airplane continued to turn, the descent rate increased; the average rate of descent for the final 10 seconds of the recorded ADS-B data was about 12,900 ft per minute. The final recorded ADS-B data point was located about 900 ft west of the main wreckage location at an altitude of 4,350 ft msl. The accident site was located about 24 nautical miles west of T67.

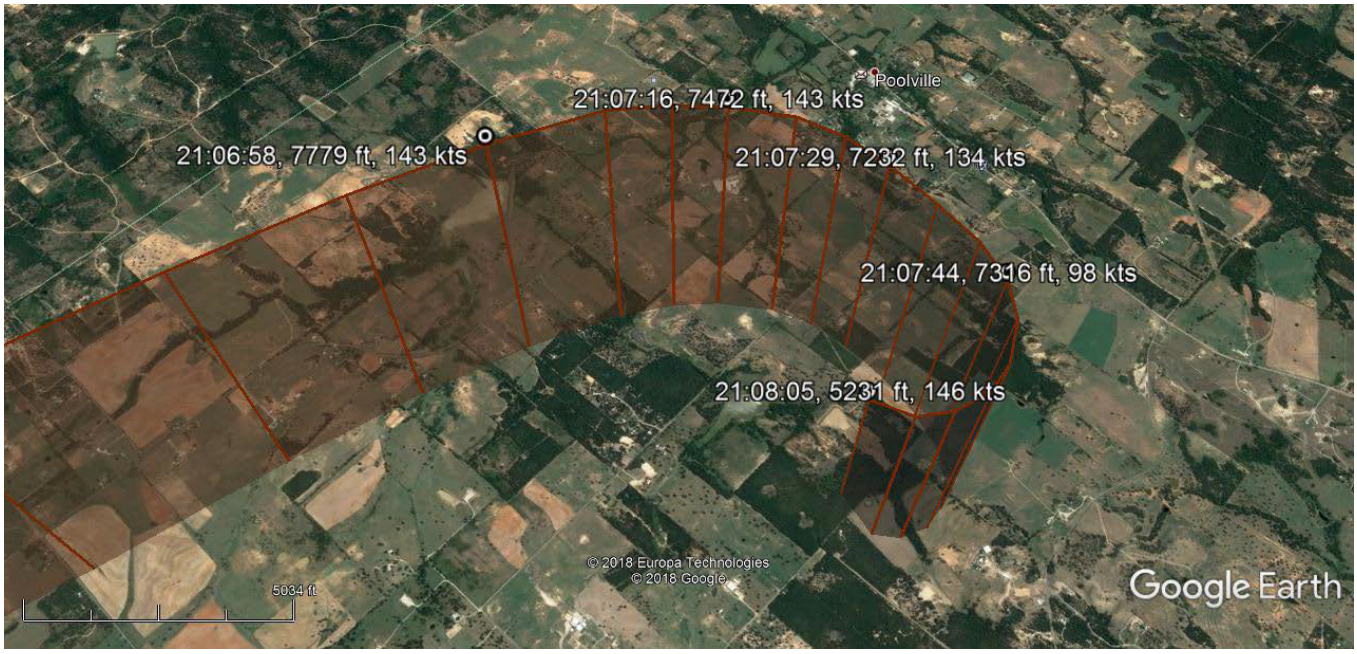

Figure. GPS data showing the final portion of the accident flight.

Pilot Information

Certificate:	Commercial	**Age:**	44,Male
Airplane Rating(s):	Single-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 1 Without waivers/limitations	**Last FAA Medical Exam:**	October 17, 2016
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:	1056.3 hours (Total, all aircraft), 890 hours (Pilot In Command, all aircraft)		

A review of the pilot's logbook indicated that he had 2.3 hours of actual instrument flight experience and 43 hours of simulated instrument flight experience. Between June 8, 2018, and the last entry dated September 28, 2018, the pilot logged 0.2 hour of actual instrument flight and no simulated instrument flight.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N221MC
Model/Series:	PA32RT 300	**Aircraft Category:**	Airplane
Year of Manufacture:	1978	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	32R-7885032
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Lycoming
ELT:		**Engine Model/Series:**	IO-540-K1G5D
Registered Owner:		**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	XBP,864 ft msl	**Distance from Accident Site:**	15 Nautical Miles
Observation Time:	21:15 Local	**Direction from Accident Site:**	12°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 3000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.94 inches Hg	**Temperature/Dew Point:**	18°C / 17°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Ruidoso, NM (SRR)	**Type of Flight Plan Filed:**	None
Destination:	Fort Worth, TX (T67)	**Type of Clearance:**	None
Departure Time:	13:25 Local	**Type of Airspace:**	Class G

The weather observations surrounding the accident site indicated marginal visual flight rules conditions with ceilings overcast from 2,500 to 3,000 ft above ground level (agl). Several airport weather stations immediately north and north-northeast of the accident site reported instrument flight rules (IFR) conditions to low IFR conditions at the time of the accident. No breaks in the overcast layer of clouds were reported surrounding the time of the accident. Satellite imagery indicated the presence of nimbostratus-type clouds over the accident area, with cloud tops near 19,000 ft over the accident site. There was no record of any preflight weather briefings or flight plan being filed by the accident pilot.

The recorded weather conditions at SRR about the departure time included clear skies and 10 miles of visibility, but weather observations along the route of flight indicated that the conditions deteriorated as the flight progressed.

There was no record of the pilot receiving any preflight weather briefings or filing a flight plan.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	32.969444,-97.87889

The airplane wreckage was distributed in a northeast direction for about 3,600 ft. The main wreckage consisted of most of the fuselage, the inboard right wing, and the airplane's engine. The elevation at the main wreckage location was about 1,250 ft msl. The left wing was found about 500 ft and 320° from the main wreckage. The airplane's left fiberglass wing tip was located about 3,500 ft and 58° from the main wreckage. Various other airplane parts were found distributed in a triangle-shaped pattern formed by the location of the main wreckage, the left wing, and the left wing tip. Additional debris determined to be items from within the airplane came to rest about 6,500 ft and 62° from the main wreckage.

The right side of the horizontal stabilator failed in downward bending, and the left side of the horizontal stabilator failed in upward bending. The left wing was located at the beginning of the wreckage path.

The airplane's vacuum pump was damaged, but no preimpact defects were noted. The gyroscope cores from two vacuum-operated instruments were found and disassembled. In both cases, the spinning portion of the gyroscopes and the gyroscope housings had evidence of rotational scoring, indicating that the gyroscopes were spinning upon impact.

Examination of the airframe and engine revealed no anomalies consistent with a prebreakup failure or malfunction.

Additional Information

The FAA Civil Aeromedical Institute's publication, "Introduction to Aviation Physiology," defines spatial disorientation as a "loss of proper bearings; 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 IFR conditions, frequent transfer between visual flight rules and IFR conditions, and unperceived changes in aircraft attitude.

The FAA's Airplane Flying Handbook (FAA-H-8083-3B) describes some hazards associated with flying when the ground or horizon are obscured. The handbook states, in part, the following:

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 sense attitude changes that 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.

The FAA's Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25B) provides information concerning spatial disorientation and vestibular illusions. Regarding the "graveyard spiral" illusion, the handbook states the following:

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 of lift, the pilot may notice a loss of altitude. The absence of any sensation of turning created 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

An autopsy was performed by the Office of Chief Medical Examiner, Tarrant County Medical Examiner's District, Fort Worth, Texas. The pilot's cause of death was blunt force trauma.

Toxicology testing performed at the FAA Forensic Sciences Laboratory was negative for ethanol and all tested-for substances.

Preventing Similar Accidents

Reduced Visual References Require Vigilance

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.

Preflight weather briefings are critical to safe flight. In-flight, weather information can also help pilots make decisions, as can in-cockpit weather equipment that can supplement official information. In-cockpit equipment requires an understanding of the features and limitations.

We often see pilots who decide to turn back after they have already encountered weather; that is too late. Pilot's shouldn't allow a situation to become dangerous before deciding to act. Additionally, air traffic controllers are there to help; be honest with them about your situation and ask for help.

Even when flying at night, visual weather conditions can also be challenging. Remote areas with limited ground lighting provide limited visual reference cues for pilots, which can be disorienting or render rising terrain visually imperceptible. Topographic references can help pilots become more familiar with the terrain. The use of instruments, if pilots are proficient, can also help pilots navigate these challenging areas.

See http://www.ntsb.gov/safety/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):	Brannen, John
Additional Participating Persons:	Chuck Kuykendall; FAA North Texas FSDO; Fort Worth, TX John Hirsch; Piper Aircraft; Wichita, KS
Original Publish Date:	July 13, 2020
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98467