



Aviation Investigation Final Report

Location:	Greensburg, Indiana	Accident Number:	CEN13FA085
Date & Time:	December 2, 2012, 18:16 Local	Registration:	N92315
Aircraft:	Piper PA 46-350P	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The instrument-rated private pilot was executing a nonprecision instrument approach procedure at night in deteriorating weather conditions. According to GPS track data, the pilot executed the approach as published but descended below the missed approach point's minimum altitude before executing a climbing right turn. This turn was not consistent with the published missed approach procedure. The airplane then began a series of left and right ascending and descending turns to various altitudes. The last few seconds of recorded data indicated that the airplane entered a descending left turn. Two witnesses heard the airplane fly overhead at a low altitude and described the weather as foggy. Reported weather at a nearby airport about 26 minutes before the accident was visibility less than 2 miles in mist and an overcast ceiling of 300 feet. A friend of the pilot flew the same route in a similarly equipped airplane and arrived about 30 minutes before the accident airplane. He said he performed the same approach to the missed approach point but never broke out of the clouds, so he executed a missed approach and diverted to an alternate airport. A postaccident examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

Federal Aviation Administration Flight Training Handbook Advisory Circular 61-21A cautions that pilots are particularly vulnerable to spatial disorientation during periods of low visibility due to conflicts between what they see and what their supporting senses, such as the inner ear and muscle sense, communicate. The accident airplane's maneuvering flightpath, as recorded by the GPS track data, in night instrument meteorological conditions is consistent with the pilot's loss of airplane 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 failure to maintain airplane control while maneuvering in night instrument meteorological conditions due to spatial disorientation.

Findings

Personnel issues	Spatial disorientation - Pilot
Personnel issues	Aircraft control - Pilot
Environmental issues	Dark - Response/compensation

Factual Information

History of Flight

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

On December 2, 2012, at 1816 eastern standard time, a Piper PA-46-350P, N92315, was destroyed when it collided with terrain while executing the RNAV (GPS) RWY 36 instrument approach into the Greensburg Municipal Airport (I34), Greensburg, Indiana. The instrument rated private pilot and the three passengers were fatally injured. The airplane was registered to an individual, and operated under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Instrument meteorological conditions (IMC) prevailed at the time of the accident, which was operated on an instrument flight rules flight (IFR) plan. The flight originated at Destin-Fort Walton Beach Airport (DTS), Destin, Florida, at 1518, and was en route to I34.

A review of air traffic control communications and radar data revealed that after the airplane departed Destin it was eventually cleared to an altitude of 21,000 feet mean sea level (msl) and preceded on course to I34. At 1748, the pilot requested a lower altitude and was directed to descend and maintain 14,000 feet msl. Four minutes later, the pilot requested the RNAV (GPS) RWY 36 approach into I34 and was advised to stand by.

As the airplane approached 14,000 feet msl, the pilot requested to continue his descent and was directed to descend and maintain 11,000 feet msl.

At 1759, the pilot reiterated his request for the RNAV (GPS) RWY 36 approach to I34 and requested to proceed direct to PULIC intersection, which was the initial approach fix (IAF) for the approach. A controller then cleared the pilot direct to PULIC .

At 1800, a controller directed the pilot to descend and maintain 5,000 feet msl and to contact Indianapolis Approach Control. At 1806, the pilot established communication with Indianapolis Approach and advised he was at 7,000 feet msl descending to 5,000 feet msl. The approach controller then directed the pilot to cross PULIC at 3,000 feet msl and issued a clearance for the RNAV (GPS) RWY 36 approach. The pilot acknowledged the clearance. The controller then queried the pilot to see if he had the current weather, and the pilot confirmed that he did. At 1810, the controller provided the pilot options for cancelling his IFR flight plan upon termination of his flight and then approved a frequency change. The pilot acknowledged and there were no further communications with the pilot.

At 1820 Indianapolis Approach Control issued an Alert Notice (ALNOT) when they were unable to establish contact with the pilot and he did not cancel his IFR flight plan. The airplane was found by law enforcement several hours later about 0.3 miles east-southeast of the airport.

A witness was standing outside his home located east of the airport. He said it was about 1820 when he heard a low flying airplane traveling northeast to the southwest. Though he could not see the airplane

due to fog and mist, the airplane sounded slow. The witness said that as the airplane flew overhead, he thought it was in trouble because the engine sputtered for a second. The witness continued to listen to the airplane as it flew away from him, when he suddenly heard the engine rev up. He said, "That was followed by what I would call a sharp bank and then a quick descent. At the end of that sound, I heard what I would describe as a sudden stop, followed by a sound similar to that of branches going into a wood chipper." The witness then got in his truck, called the police, and tried to search for the airplane.

About the same time, the airport's co-manager was in his office located next to the airport when he heard an airplane fly very low overhead. He said that he turned to his wife and asked her who would be out flying that low in this weather, which he described as a quarter mile visibility, light fog and drizzle with a ceiling of 200 to 300 feet above ground level (agl) "at best." The witness ran outside to see if he could see the airplane and noted the runway lights were not turned on. He waited about two minutes to see if the airplane would return so he could turn on the runway lights. The witness did not hear the airplane return and assumed the pilot flew to his alternate airport.

Pilot Information

Certificate:	Private	Age:	46
Airplane Rating(s):	Single-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 3 Without waivers/limitations	Last FAA Medical Exam:	February 8, 2012
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 398 hours (Total, all aircraft), 52 hours (Total, this make and model)		

The pilot, age 46, held a private pilot certificate for airplane single-engine land, and instrument airplane. His last Federal Aviation Administration (FAA) third-class medical was issued in February, 2012, with no limitations. A review of the pilot's logbook revealed he had accumulated 398 hours total time with 52 hours in the same make/model as the accident airplane. He also logged 43.1 hours simulated instrument and 29.3 hours of total actual instrument time.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N92315
Model/Series:	PA 46-350P	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	4622135
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	October 5, 2012 Annual	Certified Max Gross Wt.:	4100 lbs
Time Since Last Inspection:	47 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	1612 Hrs at time of accident	Engine Manufacturer:	LYCOMING
ELT:	Installed, activated, aided in locating accident	Engine Model/Series:	TIO-540 SER
Registered Owner:	Donald P. Horan	Rated Power:	350 Horsepower
Operator:	Donald P. Horan	Operating Certificate(s) Held:	None

The Piper PA-46-350P is a pressurized six-seat, low-wing, retractable landing gear airplane, and was manufactured in 1993. It was powered by a Lycoming TIO-540-AE2A, 350-horsepower engine and equipped with a Hartzell model HC-12YR-1BF constant-speed propeller.

A review of the maintenance logbooks revealed that an annual inspection was completed on October 5, 2012. At the time of the inspection, the tachometer read 1,564.8 hours; the airframe total time was 1,612.0 hours, and the engine time since major overhaul was 642.1 hours.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Night/dark
Observation Facility, Elevation:	BAK,656 ft msl	Distance from Accident Site:	18 Nautical Miles
Observation Time:	17:50 Local	Direction from Accident Site:	257°
Lowest Cloud Condition:		Visibility	2 miles
Lowest Ceiling:	Overcast / 300 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	6 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	170°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.06 inches Hg	Temperature/Dew Point:	14°C / 14°C
Precipitation and Obscuration:			
Departure Point:	Destin, FL (KDTS)	Type of Flight Plan Filed:	IFR
Destination:	Greensburg, IN (I34)	Type of Clearance:	IFR
Departure Time:	15:18 Local	Type of Airspace:	

The published weather minimums for the RNAV (GPS) RWY 36 approach into Greensburg included a 700 foot ceiling (agl) and 1-mile visibility.

The closest weather reporting location to the accident was the Columbus Municipal Airport (BAK), which was 18 miles northwest of the accident site.

At 1650, weather was reported as wind from 190 degrees at 5 knots, visibility 3 miles, mist, overcast ceiling 1,000 feet, temperature 58 degrees F and a dewpoint 57 degrees F.

At 1750, weather was reported as wind from 170 degrees at 6 knots, visibility less than 2 miles in mist, overcast ceiling 300 feet agl. The temperature and dewpoint were 57 degrees F.

A search of Mesowest sites across Indiana indicated a remote weather station located in Greensburg (IN012) approximately 2 miles northeast of the airport. Although it's not intended for aviation use, at 1810, the site reported a temperature of 53 degrees F, a dew point of 53 degrees F, a relative humidity of 99 percent, and wind from the southwest at 5 knots.

The Chicago Area Forecast that was issued at 1445 and included southern Indiana, indicated a cold front was expected to become a warm front over the region during the time period. The general route forecast for Indiana expected broken to overcast clouds between 1,500 to 2,500 feet with tops of 5,000 feet, with occasional visibility 3 to 5 miles in mist. Only the outlook forecast was forecasting IFR conditions due to low ceilings and visibility for the following day between 0300 and 0900.

A review of the available weather products that were available to the pilot prior to the flight revealed that no significant meteorological (SIGMETS) warnings were issued and an airman meteorological (AIRMET) for IFR conditions was issued and valid for extreme northern Indiana only.

Due to deteriorating conditions that were not previously forecasted, the national Weather Service issued an update to the AIRMET at 1815. At the time the update was issued, the pilot was already established on the approach into Greensburg.

Airport Information

Airport:	Greensburg Municipal Airport I34	Runway Surface Type:	
Airport Elevation:	912 ft msl	Runway Surface Condition:	Wet
Runway Used:	36	IFR Approach:	Global positioning system
Runway Length/Width:	3433 ft / 40 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	3 Fatal	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 Fatal	Latitude, Longitude:	39.340515,-85.480461(est)

The airplane impacted an open field about 0.3-miles east-southeast of the airport on a 114 degree heading. The airplane impacted the ground and came to rest approximately 335 feet from the initial impact point in a tree-covered, down-sloping embankment.

The left wing was separated about 3 feet outboard of the landing gear as well as at the wing root. Both wing sections were found along the debris path. The inboard 5 feet and 11 inches of the aileron were in place and secure. The remaining portion was separated and found along the debris path. The flap was separated in several places. The outboard 4 feet 4 inches remained partially attached to the separated outboard wing section. The remaining inboard section was fragmented and found along the debris trail.

The aileron control and balance cables were secure to the aileron sector on the wing and continuous to the wing root area where they displayed a broom-strawed separation consistent with impact overload. The remaining left side aileron control cable was continuous to the aileron control wheel sector.

The right wing outboard of the landing gear, approximately 11 feet 3 inches, was separated but remained connected to the inboard section by the aileron control cables. Both cables were secure to the aileron sector. The aileron was separated, fragmented, and found along the debris trail. The aileron control cable was continuous to the aileron control wheel sector and the balance cable was continuous to the left side cable separation.

The inboard end of the flap, about 5 feet 4 inches, was in place with the linkage secure. The remaining portion of the flap was found along the debris trail.

The flap jackscrew exhibited a 13 threads extension consistent with a flap position of 10 degrees.

Both the inboard and outboard fuel filler caps on both wings were in place and secure with no evidence of staining in the area.

The landing gear switch in the cockpit was in the extended position and the landing gear actuators were in the extended and locked position.

The landing gear actuators were extended and locked. Both the inboard and outboard fuel filler caps were in place and secure with no evidence of staining in the area.

The left and right horizontal stabilizers and elevators were impact separated and found along the debris trail. The elevator control rod was impact separated from the elevator sector in the aft fuselage and the sector was broken. Both the upper and lower elevator cables were secure to the aft elevator sector and continuous and secure to the forward control wheel elevator sector.

The pitch trim drum aft side inner shaft extension measured about 1.0 inches. This position is consistent with a setting of about 25-percent nose down trim.

The vertical stabilizer and rudder assembly were separated aft of the fuselage aft pressure bulkhead but remained partially attached to the fuselage by the structure and control cables. The rudder was secure at all hinge points and free to move. The rudder control cables were both secure to the aft rudder sector and continuous to the forward rudder sectors on the rudder pedal torque tube.

The examination of the control cables considered cuts made during extrication of the occupants as well as cuts made during the recovery process. No pre-impact control system anomalies were noted.

The fuselage displayed substantial impact damage but remained mostly intact. The propeller was separated and the engine was partially separated.

The engine fuel filter mounted on the firewall was removed and a trace amount of fuel was found in the bowl. The filter elements were removed and no blockage was noted. The fuel selector in the cockpit was positioned on the left tank. The position of the selector was verified at the valve which was also positioned on the left tank.

The engine was examined following its removal from the airframe. Individual accessories were removed and examined. Fuel was found in the fuel lines, fuel servo and fuel pump. The fuel screen in the servo was free of blockage. The magnetos were removed and found to rotate freely. Both magnetos fired at all towers when manually rotated. The top spark plugs were removed and illustrated wear consistent with normal combustion per Champion AV-27 chart. Rotation of the engine was accomplished from the accessory drive spline drive. Engine rotation verified thumb compression and suction and valve travel in all cylinders. Examination of the engine revealed no anomalies that would have precluded normal operation prior to the occurrence.

Medical and Pathological Information

An autopsy was performed on the pilot on December 4, 2012, by the Forensic Fellow to the Chief Forensic Pathologist at the Marion County Coroner's Office, Indianapolis, Indiana. The autopsy concluded that the cause of death was due to "Multiple blunt force traumatic injuries secondary to a plane crash".

Forensic toxicology was performed on specimens from the pilot by the FAA Civil Aeronautical Medical Institute (CAMI), Oklahoma City, Oklahoma. The toxicology report was negative for all items tested.

Tests and Research

The directional gyro, pilot's attitude indicator, co-pilot's indicator gyro, turn and bank gyro and the annunciator panel were examined by the NTSB Metallurgical Laboratory in Washington, DC. The indicators and gyros were submitted to determine if there was any rotational scoring/smearing present on the gyro and/or gyro case. All four gyros were examined and no scoring/smearing was found.

The annunciator panel was submitted to determine if any of the annunciator lights had hot coil filament stretching present. All the filaments for all the bulbs were intact and unstretched.

Additional Information

A handheld Garmin GPSMAP 496 was located in the wreckage and data from the unit was downloaded at the National Transportation Safety Board's (NTSB) Vehicle and Records Laboratory. The data revealed the unit was turned on and began recording at 1505:04 while the airplane was on the ground in Destin, Florida. According to the data, the airplane departed Destin at 1518:24 and began a descent into I34 at 1747:23.

A graphical overlay was generated depicting the airplane's arrival and approach into I34 via the RNAV (GPS) RWY 36 instrument approach procedure. At 1808:39, the airplane arrived at the PULIC intersection at an altitude of 5,322 feet msl and a groundspeed of 200 knots. The airplane then made a right turn to the east north-east and flew direct to the ZIGDO waypoint. At 1810:11, the airplane crossed over ZIGDO at an altitude of 4,049 feet msl and a groundspeed of 171 knots. The airplane then turned left and flew on a heading of 039 degrees toward the HUMIG waypoint, which was the final approach fix. The airplane crossed over HUMIG at 1812:34 at 2,434 feet msl at a groundspeed of 138 knots.

Shortly after passing HUMIG, the airplane initiated a descending left turn to a heading of about 014 degrees, and its groundspeed increased to 155 knots. When the airplane reached the RW36 waypoint,

which was the missed approach point, it was at an altitude of 1,155 feet msl at a groundspeed of about 132 knots. This was below the published minimum descent altitude of 1,560 feet (700 feet above ground level). The airplane then began a climbing right turn toward the northeast to an altitude of 1,434 feet msl and the groundspeed slowed to 89 knots. The airplane then entered a series of climbing and descending left and right turns that were not consistent with the published missed approach procedure. The last few seconds of data revealed the airplane had slowed to a groundspeed 46 knots before it entered a descending left turn before the data ended at 1816:42.

Prior to the arrival of the accident airplane, a friend of the pilot flew the same flight in a similarly-equipped airplane. According to the friend, he said he arrived approximately 30 minutes prior to the accident airplane and performed the same approach to the missed approach point. The friend never broke out of the clouds, so he executed a missed approach and diverted to an alternate airport.

According to the FAA Flight Training Handbook, Advisory Circular (AC) 61-21A, page 9, "The flight attitude of an airplane is generally determined by reference to the natural horizon. When the natural horizon is obscured, attitude can sometimes be maintained by reference to the surface below. If neither horizon or surface references exist, the airplane's attitude must be determined by artificial means - an attitude indicator or other flight instruments. Sight, supported by other senses such as the inner ear and muscle sense, is used to maintain spatial orientation.

However, during periods of low visibility, the supporting senses sometimes conflict with what is seen. When this happens, a pilot is particularly vulnerable to spatial disorientation. Spatial disorientation to a pilot means simply the inability to tell "which way is up."

According to an FAA Instrument Flying Handbook, AC 61-27C (Section II, "Instrument Flying: Coping with Illusions in Flight"), an illusion or false impression occurs when information provided by sensory organs is misinterpreted or inadequate and that many illusions in flight could be created by complex motions and certain visual scenes encountered under adverse weather conditions and at night. It also stated that some illusions may lead to spatial disorientation or the inability to determine accurately the attitude or motion of the aircraft in relation to the earth's surface.

The AC further stated that the most hazardous illusions that lead to spatial disorientation are created by information received from motion sensing systems, which are located in each inner ear. The AC also stated that the sensory organs in these systems detect angular acceleration in the pitch, yaw, and roll axes, and a sensory organ detects gravity and linear acceleration and that, in flight, the motion sensing system may be stimulated by motion of the aircraft alone or in combination with head and body movement. The AC listed some of the major illusions leading to spatial disorientation as follows:

"The leans - A banked attitude, to the left for example, may be entered too slowly to set in motion the fluid in the 'roll' semicircular tubes. An abrupt correction of this attitude can now set the fluid in motion and so create the illusion of a banked attitude to the right. The disoriented pilot may make the error of rolling the aircraft back into the original left-banked attitude or, if level flight is maintained, will feel compelled to lean to the left until this illusion subsides.

Coriolis illusion - An abrupt head movement made during a prolonged constant-rate turn may set the fluid in more than one semicircular tube in motion, creating the strong illusion of turning or accelerating,

in an entirely different axis. The disoriented pilot may maneuver the aircraft into a dangerous attitude in an attempt to correct this illusory movement....

Inversion illusion - An abrupt change from climb to straight-and-level flight can excessively stimulate the sensory organs for gravity and linear acceleration, creating the illusion of tumbling backwards. The disoriented pilot may push the aircraft abruptly into a nose-low attitude, possibly intensifying this illusion.

Elevator illusion - An abrupt upward vertical acceleration, as can occur in a helicopter or an updraft, can shift vision downwards (visual scene moves upwards) through excessive stimulation of the sensory organs for gravity and linear acceleration, creating the illusion of being in a climb. The disoriented pilot may push the aircraft into a nose low attitude. An abrupt downward vertical acceleration, usually in a downdraft, has the opposite effect, with the disoriented pilot pulling the aircraft into a nose-up attitude...."

The AC also stated that these undesirable sensations cannot be completely prevented but that they can be ignored or sufficiently suppressed by pilots' developing an "absolute" reliance upon what the flight instruments are reporting about the attitude of their aircraft.

According to the FAA Instrument Flying Handbook, AC 61-27C (Section II, "Instrument Flying: Coping with Illusions in Flight"), an illusion or false impression occurs when information provided by sensory organs is misinterpreted or inadequate and that many illusions in flight could be created by complex motions and certain visual scenes encountered under adverse weather conditions and at night. It also stated that some illusions may lead to spatial disorientation or the inability to determine accurately the attitude or motion of the aircraft in relation to the earth's surface.

Administrative Information

Investigator In Charge (IIC):	Bothwell, Stuart
Additional Participating Persons:	Michael McClure; Piper Aircraft Company; Vero Beach, FL Mark W Platt; Lycoming Engines; Williamsport, PA Terry Dill; FAA; Indianapolis, IN
Original Publish Date:	March 24, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=85716

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).