



National Transportation Safety Board Aviation Accident Final Report

Location:	Milaca, Minnesota	Accident Number:	CEN11FA133
Date & Time:	December 30, 2010, 09:58 Local	Registration:	N9103N
Aircraft:	Piper PA-46-310P	Aircraft Damage:	Substantial
Defining Event:	Unknown or undetermined	Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

About 20 minutes after departing on a cross-country flight, the pilot acknowledged the air traffic controller's clearance to climb to 17,000 feet mean sea level (msl). Radar data indicated that the airplane reached a maximum altitude of 16,800 feet msl. The airplane then entered a right descending turn followed by a left descending turn. While in the left turn, the pilot informed the controller, "I lost my autopilot; I'm in an unusual attitude." The pilot stated this same information two more times in response to transmissions by the controller. The pilot's last transmission was that he was busy trying to recover the airplane. Witnesses heard the airplane flying overhead for several minutes, but they could not see it due to the low ceiling.

A postaccident examination of the airplane did not reveal any preaccident mechanical malfunctions or failures with the engine that would have precluded normal operation. Examination of the autopilot system revealed a loose screw inside the pitch servo housing. The screw was one of two that secured the high wattage resistor to the solenoid housing. Observed corrosion within the screw threads was consistent with the threads not being engaged in a nut or other internally threaded feature. No mechanical damage or arcing was visible on the screw. The operational impact of the loose screw is unknown.

The pilot's instrument flying proficiency could not be determined. According to log records, the pilot last flew 4.5 months before the accident. The airplane was in instrument meteorological conditions when the pilot stated that he was trying to recover from the unusual attitude. The pilot did not follow prescribed procedures for an autopilot malfunction. Weather data indicates that the airplane most likely encountered turbulence and icing conditions during the flight; however, the airplane was equipped with an ice protection system. Although ethanol was found during the toxicology tests, the levels varied greatly among the tissue/fluid samples. The investigation was unable to determine if the presence of ethanol was from ingestion or from postmortem production or contamination. The detected level of diphenhydramine, an over-

the-counter sedating antihistamine used to treat allergies, was above therapeutic levels and likely contributed to the pilot's inability to recover from the unusual attitude.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot did not recover from an unusual attitude while operating in instrument meteorological conditions following a disconnect of the autopilot system for undetermined reasons. Contributing to the accident were the pilot's lack of recent flight experience and impairment due to diphenhydramine.

Findings

Personnel issues	Aircraft control - Pilot
Environmental issues	(general) - Not specified
Environmental issues	Conducive to structural icing - Not specified
Personnel issues	Recent experience - Pilot
Aircraft	Autopilot system - Not specified
Aircraft	(general) - Not attained/maintained
Personnel issues	OTC medication - Pilot
Environmental issues	Clouds - Effect on operation

Factual Information

HISTORY OF FLIGHT

On December 30, 2010, at 0958 central standard time, a Piper PA-46-310P, N9103N, collided with the terrain in Milaca, Minnesota, after the pilot reported the autopilot was no longer functioning and he was trying to recover from an unusual attitude. The private pilot, passenger, and a dog on board were fatally injured. The airplane was substantially damaged. The 14 Code of Federal Regulations Part 91 personal flight was operating in instrument meteorological conditions. The pilot had filed and activated an instrument flight rules (IFR) flight plan. The flight departed from the Aitkin Municipal Airport (AIT), Aitkin, Minnesota, about 0930, and was en route to the Beaumont Municipal Airport (BMT), Beaumont, Texas.

The pilot contacted the Minneapolis Air Route Traffic Control Center at 0928 requesting an IFR clearance to BMT. The pilot was cleared direct to BMT and given an initial departure altitude of 5,000 feet. Five minutes later, the pilot reported to air traffic control that he was passing through 2,200 feet climbing to 5,000 feet. The pilot was instructed to climb and maintain 8,000 feet. The pilot acknowledged the clearance and at this time radar showed the airplane was about eight miles south of AIT. The pilot was then issued a frequency change.

The pilot checked-in on the new frequency reporting he was at 4,000 feet climbing to 8,000 feet. The air traffic controller instructed the pilot to climb and maintain 22,000 feet (flight level [FL] 220). The pilot acknowledged this clearance. At 0950, the controller instructed the pilot to maintain 17,000 feet. Once again, the pilot acknowledged this instruction. According to radar data, at 0950:44, upon reaching 16,800 feet, the airplane entered a descending right turn. The airplane completed a 360 degree right turn followed by a 360 degree left turn. Approximately two minutes later, the controller instructed the pilot to climb and maintain FL190. The pilot responded, "I lost my autopilot I'm in an unusual attitude." When the controller asked the pilot to repeat what he had said, the pilot replied, "I've lost my autopilot and in an unusual attitude." The controller stated to the pilot that he did not understand what he had said, and again the pilot replied that he had "lost" the autopilot and he was trying to recover from an unusual attitude. Approximately one minute later, the controller asked the pilot if he needed assistance. The pilot replied that he was busy trying to recover the airplane. This was the last transmission from the pilot.

The last radar data containing mode C altitude information was recorded at 0951:24. At this time the airplane was in a left turn and the altitude was reported as 16,000 feet. The last radar contact with the airplane was at 0955. The location of this radar data was nearly over the accident site.

There were no eye witnesses to the accident. Ear witnesses reported hearing the airplane overhead and the engine sounds varying. One witness, who holds a pilot certificate, stated he first heard the airplane engine "winding up which I assumed it was in a spiral." He stated it then sounded as if the pilot got out of the spiral and the airplane was coasting as it traveled north. He stated he heard the airplane travel back over his house with the engine sounding as if the throttle was still pulled back. He believed the airplane then turned and headed back north

as he did not hear any engine sounds for a minute or two. He then heard the airplane heading back to the south, southeast toward his house. He stated he could hear the engine running, but it sounded like it was at idle. He then heard the engine sounds “wind up” and he thought the airplane was in a spiral. He did not hear an impact, but the engine sounds eventually ceased. The witness contacted the local authorities and went looking for the airplane which he located in a field near his residence.

PERSONNEL INFORMATION

The pilot, age 65, held a private pilot certificate with airplane single-engine land, instrument airplane, and glider ratings. He held a third-class airman medical certificate issued June 9, 2009. The medical certificate contained a limitation that the pilot must wear corrective lenses. The pilot reported having 2,000 hours of flight time on the application for the medical certificate.

The pilot’s family provided two pilot logbooks for review. The first logbook contained entries between August 5, 1997, and August 13, 2005. The flight time logged in this book totaled 949 hours, of which 34 hours were in the accident airplane. The second log book contained entries which totaled about 45 hours of flight time, of which approximately 43 hours were in the accident airplane. It could not be determined in what year some of the flights were flown.

An aircraft flight log page was found in the wreckage. The log contained flights for the accident airplane dated between May 1, 2009, and December 30, 2010. The second to last flight on the log was dated August 12, 2010. The date, departure airport, and destination airport of the last entry matched the accident flight. The flight times on this log totaled 90.5 hours, not including the accident flight.

The pilot’s last flight review and instrument proficiency check were conducted on October 2, 2009. The instructor who provided the flight review and instrument proficiency check stated that he provided flight training for the pilot in 2007, 2008, and on October 2, 2009. He stated that the pilot had training scheduled with him in October 2010. The pilot called him about a week before the training stating he had to cancel because he had a landing mishap in the airplane and it was being repaired. The pilot told him he was going to call and reschedule when the airplane was repaired, but the instructor never heard back from the pilot.

The instructor stated that most PA-46 pilots fly using the autopilot and that the accident pilot was no exception. He stated that during the training he provides, he has pilots hand-fly the airplane. Although not documented in the pilot’s records, the instructor stated that unusual attitude recovery is typically a part of the flight training he provides. He described the accident pilot as being an average to below average pilot compared to other pilots that he trains.

Federal Aviation Regulations, 14 Code of Federal Regulations Part 61, state that in order to act as pilot in command under IFR a pilot must perform and log at least six instrument approaches, holding procedures and tasks, and intercepting and tracking courses through the use of navigational electronic systems within the preceding six calendar months. The pilot’s logbook did not indicate that he met this requirement.

AIRCRAFT INFORMATION

The six-seat, low-wing, pressurized, retractable-gear airplane, serial number 4608021, was manufactured in 1986. The airplane was registered to a company which was owned by the pilot. The airplane was powered by a Continental TSIO-550-C(1) engine, serial number 814578R. The engine and propeller, a Hartzell PHC-G3YF-1E/7890K were installed on the airplane in accordance with Supplemental Type Certificate number SA01770CH.

Based on the hobbs meter, legible records, and the aircraft flight log, the aircraft total time at the time of the accident was estimated to be 2,465.5 hours. The hobbs time at the time of the accident was 727.5 hours. A review of the maintenance records revealed the last aircraft annual inspection was completed on March 15, 2010, at a total aircraft time of 2,438.7 hours. The last maintenance recorded for the airplane was dated September 13, 2010, at a hobbs time of 726 hours. The last static altimeter transponder certification inspection was performed on February 2, 2010.

The zero-time factory rebuilt engine was installed in the airplane on March 15, 2006, at a total aircraft time of 1,778.2 hours. According to the engine logbook, the last inspection performed was a 100 hour inspection completed on March 15, 2010, at an engine time in service of 660.5 hours.

The airplane was equipped with an ice protection system. Section 10 of the Pilot's Operating Handbook stated: "The ice protection system was designed and tested for operation in the meteorological conditions of FAR 25, Appendix C, for continuous maximum and intermittent maximum icing conditions. The ice protection system was not designed or tested for flight in freezing rain and/or mixed conditions or for icing conditions more severe than those of FAR 25, Appendix C. Therefore, flight in those conditions may exceed the capabilities of the ice protection system."

The airplane was equipped with a King KFC-150 series automatic flight control system providing pitch and roll control. Both the left and right control yokes contain elevator trim and autopilot disconnect buttons. According to the aircraft logbooks and maintenance records, the pitch trim servo was removed, repaired, and reinstalled on March 11, 2008. A factory overhauled pitch trim servo, serial number 46974 was installed on October 9, 2008. The pitch and trim servos were removed and reinstalled after repair during an annual inspection on February 19, 2009. On March 20, 2009, the trim servo was removed and replaced. A work order and email obtained from a repair station indicated that the autopilot would not pass the self test mode when turned on. The pitch servo was bench tested and no discrepancies were found. The pitch trim servo was replaced with a factory overhauled unit.

METEOROLOGICAL INFORMATION

At 0734, the pilot contacted flight service for a weather briefing and to file a flight plan for the trip to BMT. The pilot was informed that there was a Minneapolis Center Watch, valid until 0910. The watch called for areas of low ceilings from 100 to 500 feet and visibility from 1/8 to 4 miles with mist, fog, drizzle, rain, and snow. The briefer informed the pilot that his altitude was going to put him on the border of an area of moderate turbulence from flight level (FL) 220 up

through FL380. The briefer stated that there was an area of moderate ice below 6,000 north of a line running from the northeast corner of the stated to the southwest corner. The pilot filed a flight plan stating the airplane had 6 hours and 30 minutes of fuel on board.

A review of the recorded surface observation weather data from the Princeton Municipal Airport (PNM), Princeton, Minnesota, located about 17 miles south-southeast of the accident site, revealed the conditions at 0955 were wind from 070 degrees at 7 knots; visibility 1 3/4 miles with moderate rain; ceiling broken at 300 above ground level (agl), overcast at 1,600 agl; temperature 2 degrees Celsius; dewpoint 1 degree Celsius; and altimeter setting 29.42 inches of mercury.

A review of the recorded surface observation weather data from the Mora Municipal Airport (JMR), Mora, Minnesota, located about 19 miles east of the accident site, revealed the conditions at 0958 were wind from 080 degrees at 5 knots; visibility 1 mile with light rain; ceiling overcast at 200 agl; temperature 1 degree Celsius; dewpoint 0 degree Celsius; and altimeter setting 29.47 inches of mercury.

Weather data received from a weather balloon which was launched at 0600 from Chanhassen, Minnesota, located 79 miles southeast of the accident site indicated the freezing level was about 5,100 feet with temperature inversions at 2,500, 8,000, 11,500 and 18,000 feet. The majority of the troposphere was stable, with a layer identified as conditionally-unstable between 12,000 and 16,000. The vertical wind profile indicated light surface wind shifted clockwise to the southwest and increased to 50 knots about FL 230. Calculations of clear air turbulence made by the Universal RAOB program indicate layers of potential moderate to extreme turbulence from the surface through FL 230. Icing calculations made by RAOB, indicated a light clear and rime ice potential in a small layer between 5,000 and 7,000 feet, as well as a light rime ice potential between 14,000 and FL260.

Geostationary satellite data indicate that the cloud tops in the area of the accident site were about FL300.

An AIRMET for moderate icing below 16,000 feet was issued at 0845 and was active for the accident location.

WRECKAGE AND IMPACT INFORMATION

The airplane came to rest in an open field that was surrounded by a wooded area. The field elevation at the site was 1,183 feet. There was a series of three main impact marks which were connected to each other. The heading from these impact marks to the main wreckage was 245 degrees. The distance from the initial impact to the main wreckage was about 360 feet. The first impact mark contained green glass and a navigational light housing. The nose gear was located near the second main impact mark and the left main landing gear was located between the third impact mark and the main wreckage.

The airplane came to rest on a heading of 158 degrees. The fuselage came to rest in an upright position with the left wing and empennage partially attached. The top of the cabin was cut by

first responders so the occupants could be removed from the airplane. The dog was found outside the airplane and it was not determined where the dog was located during the flight. The fuselage sustained impact damage. The nose of the airplane was bent downward at the firewall. The bottom surface of the fuselage was crushed upward. The bottom of the fuselage between the middle and aft seats was crushed upward and partially separated.

The aft fuselage/tailcone was partially separated from the fuselage. The vertical stabilizer, rudder, left horizontal stabilizer, and left elevator remained attached to the tailcone. The right horizontal stabilizer and elevator were partially attached to the empennage and folded under to the left side of the empennage. The rudder control stops were in place with no preimpact damage noted. The elevator trim jack screw indicated the airplane was in a slight nose-up trim condition.

The left wing sustained impact damage primarily along the outboard leading edge of the wing. The wing remained attached to the fuselage. The flap was attached to the wing. The aileron remained attached to the wing at the inboard attach point.

The right wing separated from the fuselage at the wing root. The wing was located along the left side of the main wreckage. The right wing landing gear was extended. The outboard 2/3 (about 7 feet) of the wing was bent upward about 70 degrees. The flap remained attached to the wing at the outboard attach point. The aileron was attached at the inboard attach point. The wing sustained impact damage along the leading edge.

All of the flight control surface balance weights were in place. Control cable continuity was established from the cockpit controls to the control surfaces with all cable separations exhibiting broomstraw characteristics typical of overload separations.

One propeller blade was split and shattered. Another blade was broken off near the propeller hub. The third propeller blade was intact with minor impact damage.

The throttle and propeller controls were found mid-range. The mixture control was found in the full rich position. The landing gear handle was in the down position and the flap handle was in the up position.

An examination of the engine revealed continuity throughout the engine. Compression was received on all cylinders when the crankshaft was turned by hand. A spark was received on all of the leads for each magneto when the magneto shafts were turned using an electric drill. The spark plugs were dark in color and all exhibited normal wear. Oil was present throughout the engine. The inside of the cylinders were viewed with a boroscope and no anomalies were noted which would have resulted in a loss of engine power.

Both turbochargers sustained impact damage. Vegetation and dirt were impacted in the compressor section. Scoring was visible around the shrouds for the turbine and compressor blades on both turbochargers.

An examination of the fuel pump, injector nozzles, fuel control, oil filter, propeller governor, and vacuum pumps did not reveal any anomalies. Examination of the engine did not reveal any

anomalies.

The propeller deice switch was found in the “On” position and the windshield heat switch was “Off”. It could not be determined if the surface deice system had been cycled. The deice boots on the leading edge surfaces had been breached during the impact.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot on December 31, 2010, by the Midwest Medical Examiner’s Office, Ramsey, Minnesota. The final diagnosis was reported as multiple blunt force injuries.

Forensic toxicology was performed on specimens from the pilot by the FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma. The toxicology report listed the following:

68 (mg/dL, mg/hg) Ethanol detected in Vitreous
53 (mg/dL, mg/hg) Ethanol detected in Urine
42 (mg/dL, mg/hg) Ethanol detected in muscle
32 (mg/dL, mg/hg) Ethanol detected in Blood (Cavity)
25 (mg/dL, mg/hg) Ethanol detected in Heart
0.409 (ug/ml, ug/g) Diphenhydramine detected in Blood (Cavity)
Diphenhydramine detected in Urine
Ibuprofen detected in Urine
Quinine detected in Urine
Quinine detected in Blood (Cavity)
111.2 (ug/ml, ug/g) Salicylate detected in Urine
Valsartan detected in Urine
Valsartan detected in Blood (Cavity)

A member of the pilot’s family stated the pilot had been on blood pressure medication, but he was under the impression that he no longer needed it. He also stated that the pilot was known to suffer from chronic sinus infections. The family member stated the pilot regularly drank alcohol, mostly wine and that he had recently complained of having leg cramps.

Diphenhydramine is an over the counter sedating antihistamine used to treat allergies, hay fever, common cold symptoms, nausea, vomiting, and dizziness caused by motion sickness. Diphenhydramine may also be used as a sleep aid. Diphenhydramine is found in medications such as Benedryl, Unisom gelcaps, Nytol, and Sominex.

Quinine is often prescribed to treat malaria and has been used off-label to treat leg cramps. Quinine is also found in tonic water. Quinine may cause dizziness or vertigo, blood disorders and cardiac arrhythmia.

Valsartan (Diovan) is a medication that is used to treat high blood pressure. The pilot reported the use of Diovan during his most recent airmen medical examination.

Salicylate is a metabolite of aspirin.

Ibuprofen, commonly known as Motrin or Advil, is an over the counter anti-inflammatory medication.

ADDITIONAL INFORMATION

The autopilot system components were removed from the wreckage and examined at the Honeywell facility in New Century, Kansas. The components removed consisted of the pitch servo and servo mount, the roll servo and servo mount, the pitch trim servo, the flight computer, the flight command indicator, the directional gyro, and the pictorial navigation indicator (HSI).

The pitch servo was examined and something could be heard moving around inside the pitch servo housing. When the housing was opened it was determined that the object was a loose screw. The examination revealed that one of the two screws securing the high wattage resistor to the solenoid housing was not in place. A white substance was visible on some of the screw threads and it did not appear that the threads were damaged. The screw was inserted into the screw hole and it could be tightened. The threads were not stripped. The pitch servo was installed in a test harness and the servo functioned normally when tested.

The screw was sent to the National Transportation Safety Board Material Laboratory for examination. The examination revealed there was no evidence of electrical arcing and no mechanical damage to the threads was observed. White zinc salts were present on the threads consistent with corrosion. The surface corrosion within the threads was consistent with corrosion occurring when the threads were not engaged in a nut or other internally threaded feature.

An examination and testing of the other autopilot components did not reveal any pre-impact failures/malfunctions which would have precluded normal operation of the autopilot system. There were autopilot disconnect buttons on both the left and right seat control yokes.

The Pilot's Operating Handbook Supplement for aircraft equipped with the King 150 series flight control system, Section 3 – Emergency Procedures states:

The five step procedure listed under paragraph A should be among the basic airplane emergency procedures that are committed to memory. It is important that the pilot be proficient in accomplishing all five steps without reference to this manual.

- A. In case of Autopilot, Autopilot Trim, or Manual Electric Trim malfunction (accomplish Items 1 and 2 simultaneously):
1. Airplane Control Wheel – GRAP FIRMLY and regain aircraft control.
 2. A/P DISC/TRIM INTER Switch – PRESS and HOLD throughout recovery.
 3. AIRCRAFT – RETRIM Manually as Needed.

4. PITCH TRIM Circuit Breaker – PULL.
5. AUTOPILOT Circuit Breaker – PULL

The autopilot and pitch trim circuit breakers were found pushed in.

History of Flight

Enroute-climb to cruise	Unknown or undetermined (Defining event)
Enroute-climb to cruise	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Private	Age:	65, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	Glider	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 With waivers/limitations	Last FAA Medical Exam:	July 9, 2009
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	2078 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N9103N
Model/Series:	PA-46-310P	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	4608021
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	March 15, 2010 Annual	Certified Max Gross Wt.:	
Time Since Last Inspection:	27 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	2466 Hrs at time of accident	Engine Manufacturer:	CONT MOTOR
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	TSIO-520-C(1)
Registered Owner:		Rated Power:	300 Horsepower
Operator:		Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Day
Observation Facility, Elevation:	ANE,912 ft msl	Distance from Accident Site:	48 Nautical Miles
Observation Time:	09:45 Local	Direction from Accident Site:	154°
Lowest Cloud Condition:		Visibility	4 miles
Lowest Ceiling:	Overcast / 400 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	8 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	110°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.43 inches Hg	Temperature/Dew Point:	3° C / 2° C
Precipitation and Obscuration:	N/A - None - Mist		
Departure Point:	Aitkin, MN (AIT)	Type of Flight Plan Filed:	IFR
Destination:	Beaumont, TX (BMT)	Type of Clearance:	IFR
Departure Time:	09:30 Local	Type of Airspace:	Class E

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	1 Fatal	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	45.826667,-93.71389

Administrative Information

Investigator In Charge (IIC):	Sullivan, Pamela
Additional Participating Persons:	Gordon Rother; FAA-MSP-FSDO; Minneapolis, MN Ron Maynard; Piper Aircraft; Vero Beach, FL Marc Palmateer; FSS-MSP-FSDO; Minneapolis, MN Andrew Swick; Continental Engines; Mobile, AL
Original Publish Date:	May 15, 2012
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=78075

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).