Aviation Investigation Final Report

Location:	Marion, Indiana	**Accident Number:**	CEN19FA035
Date & Time:	November 29, 2018, 14:21 Local	**Registration:**	N7751Y
Aircraft:	Piper PA 30	**Aircraft Damage:**	Destroyed
Defining Event:	Aerodynamic stall/spin	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airline transport pilot, who was also an airframe and powerplant mechanic, was conducting a personal flight in a twin-engine airplane after troubleshooting an unknown problem with the left engine fuel system; a family member described the flight as a "test flight." Witnesses reported that, after departure, the airplane climbed to about 500 ft above ground level and began a left turn. During the left turn, the airplane "nose dived" in a downward spiral, and the airplane impacted terrain.

Postaccident examinations revealed no mechanical anomalies with the airframe, right engine, or propellers that would have precluded normal operation. The left engine propeller blade damage was consistent with low or no power at the time of the accident, and the blades were found in an unfeathered position.

Evidence indicated that the pilot had recently replaced the left and right fuel selector valves and had been performing ground engine runs. A comprehensive examination of the airplane's fuel system was not possible due to the extensive fire damage to the system. However, given the unknown left engine fuel system issue, a loose left fuel selector fuel line, and the lack of power signatures on the left propeller blades, it is likely that the fuel system's performance was degraded and led to a partial or total loss of left engine power. The airplane's downward spiral was consistent with the pilot exceeding the airplane's critical angle of attack during a single-engine operation, which resulted in an aerodynamic stall and subsequent loss of control.

Toxicological testing detected a sedating antihistamine in the pilot's liver specimens, but not in his aortic blood specimens, making it less likely that the medication would be impairing. Thus, the pilot's use of this medication was likely not a factor in this accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's exceedance of the airplane's critical angle of attack following a loss of the left engine power shortly after takeoff, which resulted in an aerodynamic stall at an altitude too low for recovery. Contributing to the accident was the loss of left engine power due most likely to a fuel system issue that could not be determined based on the available evidence.

Findings

Aircraft	Airspeed - Not attained/maintained
Aircraft	Angle of attack - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Aircraft	(general) - Malfunction
Not determined	(general) - Unknown/Not determined

Factual Information

History of Flight

Initial climb	Loss of engine power (partial)
Initial climb	Aerodynamic stall/spin (Defining event)
Initial climb	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)
Post-impact	Fire/smoke (post-impact)

On November 29, 2018, about 1421 eastern standard time, a Piper PA-30 (Twin Comanche) airplane, N7751Y, impacted terrain shortly after takeoff from Marion Municipal Airport, Marion, Indiana. The airline transport pilot sustained fatal injuries, and the airplane was destroyed. The airplane was registered to and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed at the time of the accident, and a flight plan was not filed for the local flight.

According to information from a sheriff's deputy, on the day before the accident, fixed-based operator employees observed the pilot performing ground engine runs outside of his hangar. According to family members, the pilot, who was also an airframe and powerplant mechanic, had been troubleshooting an unspecified fuel system problem with the left engine.

A family member described the accident flight as a "test flight."

Witnesses reported that, after departure, the airplane climbed to an altitude of about 500 ft above ground level and began a left turn. During the left turn, the airplane "nose-dived" in a downward spiral. The airplane then impacted terrain, and a post-impact fire ensued.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	60,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:**	January 17, 2018
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	August 1, 2016
Flight Time:	2306 hours (Total, all aircraft)		

The pilot's logbook was not located during the investigation. An estimate of the pilot's flight time was determined based on his most recent airman medical application.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N7751Y
Model/Series:	PA 30 No Series	**Aircraft Category:**	Airplane
Year of Manufacture:	1965	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	30-839
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	Unknown	**Certified Max Gross Wt.:**	2381 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	IO-320-B1A
Registered Owner:	On file	**Rated Power:**	160 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The airframe, engine, and propeller logbooks were not located during the investigation. The airplane was registered to the pilot on December 17, 2008.

During an examination of the pilot's hangar after the accident, an invoice, dated November 16, 2018, was located for the purchase of left and right fuel selector valves and miscellaneous installation hardware. A search of the hangar revealed an empty shipping box for the valves. In addition, a fuel selector access plate, a fuel valve protector cover, and fuel valve control handles for the airplane were found in the hangar. To complete the installation, these components would have been removed during the replacement of the fuel selector valves, and then reinstalled at the completion of the valve installation.

The *Piper Twin Comanche Service Manual*, section IX, Fuel System, provided the following system description:

The fuel system is contained in two independent units that allow each engine to have its own fuel supply. The systems are connected only by a crossfeed that will allow fuel to be drawn from one set of fuel cells to the engine of the opposite side, in the event of an emergency. For each engine, fuel is taken from each cell through a screen located in the cell outlet fitting and then on to a shut-off selector valve. From the selector valve, fuel is drawn through an electrically operated auxiliary fuel pump and on to an engine driven pump where it is pumped to the injector unit. The fuel valves are operated through controls located in a panel, just ahead of the main spar, between the pilot seats.

The *Piper Twin Comanche Owner's Handbook*, section II, Design Information, stated the following about the fuel system:

For emergency single engine operation, a crossfeed is provided to increase the range. When using fuel from cells on the opposite side of the operating engine, move the fuel selector for the inoperative engine to the main or auxiliary position; then move the fuel selector for the operating engine to the crossfeed position. For single engine landing, fuel must be pumped from the main cell on the same side as the operating engine.

Section II of the owner's handbook, stated the following about the propellers:

The propellers are...constant-speed, controllable, full-feathering units. These are controlled entirely by use of the propeller control levers located in the center of the power control quadrant. Feathering of the propellers is accomplished by moving the controls fully aft through the low RPM detent into the feathering position. Feathering takes place in approximately three seconds.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	MZZ,858 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	14:35 Local	**Direction from Accident Site:**	360°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 2800 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	170°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.9 inches Hg	**Temperature/Dew Point:**	1°C / 0°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Marion, IN (MZZ)	**Type of Flight Plan Filed:**	None
Destination:	Marion, IN (MZZ)	**Type of Clearance:**	None
Departure Time:	14:20 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	Marion Municipal Airport MZZ	**Runway Surface Type:**	Asphalt
Airport Elevation:	858 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	22	**IFR Approach:**	None
Runway Length/Width:	6011 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	1 Fatal	**Latitude, Longitude:**	40.480556,-85.682502

The airplane came to rest upright in a soft, wet field about 1/4 mile south of the departure runway. The accident site and the airplane wreckage are shown in the figure. Postaccident examination of the airplane showed that the fuselage, empennage, and inboard sections of both wings were consumed by post-impact fire. The instrument panel, instruments, and engine controls were destroyed by fire and impact. The front left seat remained attached to the cabin floor. (The right front seat was not installed and was found in the pilot's hangar.) The main cabin door was separated and came to rest about 15 ft forward of the main wreckage. The upper latch and side pin were found engaged, consistent with a closed or locked door position.

Figure. Accident Site

The left and right wings remained partially attached to the fuselage and displayed thermal, buckling, and leading edge damage. The left and right ailerons remained attached to the wing attach brackets and control pushrod. The left and right flaps remained attached to the wing structure and displayed thermal damage. The right outboard wing and wing tip were deformed aft. A ground scar, consistent with the right wing, was noted about 3 ft in front of the damaged right wing. The right flap control mechanism displayed thermal damaged and the control arm was found between the flaps 0° and slightly extended position. The landing gear retraction push-pull rod was found in the landing gear extended position.

The empennage was consumed by fire. The horizontal and vertical stabilizers and rudder were attached and displayed thermal damage. The rudder trim mechanism shaft position correlated to a neutral rudder trim setting.

Flight control continuity for the flight control surfaces could not be determined due to impact and thermal damage; but no mechanical anomalies were noted that would have precluded normal flight

control operations.

The left engine and propeller assembly remained partially attached to the airframe. One propeller blade showed no damage, and one propeller blade was not twisted and bent aft. The right engine remained partially attached to the airframe, and the right propeller assembly was separated from the engine, aft of the crankshaft flange. The crankshaft fracture surface exhibited 45° shear lips. One propeller blade was twisted and bent forward, and one propeller blade was twisted and bent aft. Both the left and right propeller blades appeared to be in a low-pitch position.

After the on-scene examination, the airframe, engines, and systems were further examined at the recovery facility. The left fuel selector arm was found in the cross-feed position, and the right fuel selector arm was found in the right main fuel cell position. Thermal damage precluded movement of the left and right fuel selector arms to the different selector positions. The left and right main fuel cells, fuel outlet lines, and cross-feed fuel lines and fittings remained attached or partially attached to the fuel selectors and the "B" nuts were secure. The fuel lines displayed material loss and thermal damage. The left auxiliary fuel line and fitting were not located at the time of the examination, but a review of on-scene photographs showed the line and fitting partially in place on the fuel selector valve with only partial thread engagement. Magnified examination of the selector valve threads revealed the threads were undamaged.

Mechanical rotation determined left and right engine continuity to all pistons and the accessory gearboxes. Thumb compression was noted on all cylinders. The engines magnetos and accessories were thermally damaged and precluded functional testing of the components.

Medical and Pathological Information

The Northeast Indiana Forensic Center, Fort Wayne, Indiana, performed an autopsy of the pilot. The pilot's cause of death was multiple blunt force injuries. Toxicology testing performed at the Federal Aviation Administration (FAA) Forensic Sciences Laboratory identified doxylamine (0.153 ug/mL, ug/g) in the pilot's liver specimens, but in the pilot's aortic blood specimens. The tests were negative for carbon monoxide and ethanol.

Doxylamine is a sedating antihistamine available over the counter to treat allergy symptoms or use as a sleep aid. Doxylamine undergoes postmortem distribution and central blood levels may be two to three times higher than peripheral blood levels.

Administrative Information

Investigator In Charge (IIC):	Sauer, Aaron
Additional Participating Persons:	Robert Pay; Federal Aviation Administration; Indianapolis, IN Kathryn Whitaker; Piper Aircraft; Phoenix, AZ Troy Helgeson; Lycoming Engines; Williamsport, PA
Original Publish Date:	April 13, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98701