



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Salisbury, North Carolina	Accident Number:	WPR18LA194
Date & Time:	June 29, 2018, 16:03 Local	Registration:	N8440F
Aircraft:	Piper PA32	Aircraft Damage:	Substantial
Defining Event:	Fuel related	Injuries:	3 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot departed with his passengers on a cross-country flight with the main and auxiliary fuel tanks at full capacity. About 2 hours and 18 minutes into the flight, the engine lost total power. The pilot was unable to restart the engine and declared an emergency. The controller provided vectors to a nearby airport, where the airplane landed hard, resulting in substantial damage.

First responders reported that they drained about 55 gallons of fuel from the airplane after the accident and an additional, unquantified amount spilled onto the ground; however, the fuel was drained before the airplane could be examined and the amount of fuel onboard and its distribution at the time of the accident could not be confirmed. Data retrieved from an onboard engine monitoring system showed erratic fuel flow indications concurrent with a sudden decrease in exhaust gas temperatures. These erratic fuel flow indications suggest the possibility that the transducer was pulling in air due to an interruption in fuel flow, which may have been the result of fuel starvation or an introduction of air within the fuel system upstream of the transducer. The fuel lines were not tested, as they had been cut by recovery personnel.

A postaccident examination of the engine revealed no fuel in the line between the engine-driven fuel pump and the fuel servo, which typically captures and retains unused fuel destined for the engine. A subsequent engine run revealed no anomalies of the engine. Given the available information, it is likely that the loss of engine power was the result of fuel starvation; however, whether the fuel starvation was the result of fuel mismanagement or an introduction of air into the fuel system could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

A total loss of engine power due to fuel starvation for reasons that could not be determined based on the available information.

Findings

Aircraft	Fuel - Not specified
Aircraft	(general) - Failure
Not determined	(general) - Unknown/Not determined

Factual Information

History of Flight

Enroute-cruise	Fuel related (Defining event)
Enroute-cruise	Loss of engine power (total)
Landing	Collision with terr/obj (non-CFIT)

On June 29, 2018, about 1603 eastern daylight time, a Piper PA-32-300, N8440F, was substantially damaged when it was involved in an accident near Salisbury, North Carolina. The private pilot and two passengers were not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

On the morning of the accident, the pilot and passengers departed New York for North Carolina. The pilot refueled the airplane with 24 gallons of fuel during an intermediate stop; before departing, he completed a preflight inspection and an engine run-up, which revealed no anomalies. Shortly after departure, the pilot decided to return to the airport to inspect the left-wing fuel cap. After landing and confirming that the fuel cap was secured, the pilot departed again and climbed to a cruise altitude of 6,500 ft mean sea level (msl). About 2 hours into the flight, the engine slowed to 1,500 rpm and 15 seconds later, the engine lost total power. The pilot activated the fuel pump, applied full rich mixture, and checked both magnetos, but was unable to restart the engine and declared an emergency with air traffic control. The controller advised the pilot of an airport about 7 nautical miles from his position. The pilot subsequently landed on the grass between a runway and taxiway, as there was a construction crew repaving the runway. During the landing, the right main landing gear impacted the ground first and the airplane jerked to the right before coming to rest in the grass.

Examination by a Federal Aviation Administration (FAA) inspector revealed substantial damage to the engine firewall and left wing. Both the main and auxiliary fuel tanks were drained before his arrival at the accident site. First responders reported that they drained a total of 55 gallons of fuel from the airplane immediately after the accident and estimated that about 25 gallons of fuel had spilled on the ground.

The airplane was equipped with an engine monitoring system that captured numerous parameters, including fuel flow, engine rpm, exhaust gas temperature (EGT), and cylinder head temperature (CHT). The data was downloaded by the National Transportation Safety Board Recorders Laboratory. The EGT values for each cylinder and engine rpm were consistent for the majority of the flight until about 1559:10, when the EGTs dropped from about 1,500° F to about 300° F and continued to decrease and fuel flow values became erratic. At 1559:30, the engine rpm decreased from 2,400 rpm to about 1,600 rpm and stabilized for 30 seconds before further decreasing to 1,300 rpm. At 1601:45, the fuel flow spiked to about 117 gph and then rapidly fell to 20 gph, at which point the data track ended. The engine rpm then advanced to 1,700 rpm about 1602, before rapidly decreasing to idle power at 1603:35.

According to a representative of the fuel flow transducer manufacturer, erratic fuel flow indications can be representative of the unit intaking air, radio frequency interference, or a poor connection between the transducer and the reading instrument.

Review of maintenance logbooks revealed that the airplane's most recent annual inspection was performed on September 16, 2017 at 3,661 hours total time in service, about 81 flight hours before the accident. At the time of the inspection, the engine had accumulated a total of 1,660 hours since its most recent overhaul.

The airplane was equipped with two main fuel tanks, located inboard in each wing, with a total capacity of 50 gallons. The airplane was also equipped with two auxiliary fuel tanks located on the wingtips, with a total capacity of 84 gallons.

The airplane's Pilot's Operating Handbook stated, "...lateral trim is best maintained by using fuel alternatively from each main tank, and when these are nearly exhausted, from each tip tank. It is recommended that one main tank be used for one hour after takeoff, the other main tank used until nearly exhausted, then return to the first main tank. When nearly exhausted, turn to one tip tank and alternate at one-half hour intervals to maintain lateral trim."

Examination of the airplane revealed that the top and bottom engine cowlings were intact and attached to the forward fuselage. Both propeller blades were bent, and the nose landing gear was crushed and folded aft. The engine controls were intact and continuous from the cockpit to the engine.

The fuel tanks were intact. The fuel gascolator bowl contained a trace amount of 100 low lead aviation grade fuel and the fuel gascolator screen did not display any contaminants. Each of the fuel lines downstream of the electric fuel pump were opened and did not display any liquid. The upstream fuel lines were not inspected or tested as they had been cut by recovery personnel. The fuel selector valve moved normally through each of its detents and was found in the left tank position.

Mechanical continuity was established throughout the engine and valvetrain when the engine was rotated by hand. As the engine was rotated, the left magneto impulse coupling was heard (the right magneto was not equipped with an impulse coupling). Fuel was plumbed into the airframe fuel pump to facilitate an engine test run.

The engine started normally and ran for several minutes at various power settings between idle and 1,800 rpm. During this time, oil pressure, fuel pressure, fuel flow, manifold pressure, alternator output, and pneumatic pressure all displayed normal indications.

Based on the pilot's reported fuel management procedure of changing tanks every 30 minutes, the airplane would have had about 11 gallons of fuel in the right main tank and 8 gallons in the left main tank at the time of the power loss. However, the left main tank would have been nearly void of fuel had the pilot omitted his procedure to switch to the right fuel tank only once. Further, the fuel selector was found at the accident site in the left tank detent. According to the pilot, he used a combination of reminders on his watch and the Garmin GPS display, which issued a warning to him every 15 minutes to remind him to switch fuel tanks.

Pilot Information

Certificate:	Private	Age:	65, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	3-point
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 With waivers/limitations	Last FAA Medical Exam:	July 18, 2016
Occupational Pilot:	No	Last Flight Review or Equivalent:	September 12, 2017
Flight Time:	457 hours (Total, all aircraft), 38 hours (Total, this make and model), 391 hours (Pilot In Command, all aircraft), 4 hours (Last 90 days, all aircraft), 4 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Passenger Information

Certificate:		Age:	Male
Airplane Rating(s):		Seat Occupied:	Left
Other Aircraft Rating(s):		Restraint Used:	Lap only
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:			

Passenger Information

Certificate:		Age:	Female
Airplane Rating(s):		Seat Occupied:	Right
Other Aircraft Rating(s):		Restraint Used:	Lap only
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N8440F
Model/Series:	PA32 300	Aircraft Category:	Airplane
Year of Manufacture:	1976	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	32-7740023
Landing Gear Type:	Tricycle	Seats:	6
Date/Type of Last Inspection:	September 16, 2017 Annual	Certified Max Gross Wt.:	3400 lbs
Time Since Last Inspection:	81 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	3661.7 Hrs as of last inspection	Engine Manufacturer:	Lycoming
ELT:	Installed, not activated	Engine Model/Series:	IO-540-KIG5
Registered Owner:		Rated Power:	300 Horsepower
Operator:		Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KRUQ, 773 ft msl	Distance from Accident Site:	3 Nautical Miles
Observation Time:	16:15 Local	Direction from Accident Site:	54°
Lowest Cloud Condition:	Scattered / 6000 ft AGL	Visibility	10 miles
Lowest Ceiling:	Broken / 7000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:		Temperature/Dew Point:	32°C / 19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Salisbury, MD (KSBY)	Type of Flight Plan Filed:	VFR
Destination:	Lake Norman, NC (14A)	Type of Clearance:	VFR; VFR flight following
Departure Time:	13:50 Local	Type of Airspace:	Class E

Airport Information

Airport:	Rowan County KRUQ	Runway Surface Type:	Grass/turf
Airport Elevation:	772 ft msl	Runway Surface Condition:	Dry
Runway Used:		IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	Forced landing;Straight-in

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	2 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	3 None	Latitude, Longitude:	35.645832,-80.520278

Administrative Information

Investigator In Charge (IIC):	Stein, Stephen		
Additional Participating Persons:	Paul Meyer; Federal Aviation Administration; Charlotte, NC Kathryn Whitaker; Piper Aircraft Company; Vero Beach, FL		
Original Publish Date:	May 25, 2021	Investigation Class:	3
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=97755		

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](#).