



Aviation Investigation Final Report

Location:	Baton Rouge, Louisiana	Accident Number:	CEN18LA285
Date & Time:	July 20, 2018, 14:30 Local	Registration:	N327BK
Aircraft:	Smith Aerostar601	Aircraft Damage:	Substantial
Defining Event:	Loss of engine power (total)	Injuries:	2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The mechanic who maintained the airplane reported that, on the morning of the accident, the right engine would not start due to water contamination in the fuel system. The commercial pilot and mechanic purged the fuel tanks, flushed the fuel system, and cleaned the left engine fuel injector nozzles. After the maintenance work, they completed engine ground runs for each engine with no anomalies noted. Subsequently, the pilot ordered new fuel from the local fixed-based operator to complete a maintenance test flight. The pilot stated that he completed a preflight inspection, followed by engine run-ups for each engine with no anomalies noted and then departed with one passenger onboard. Immediately after takeoff, the right engine stopped producing full power, and the airplane would not maintain altitude. No remaining runway was left to land, so the pilot conducted a forced landing to a field about 1 mile from the runway; the airplane landed hard and came to rest upright.

Postaccident examination revealed no water contamination in the engines. Examination of the airplane revealed numerous instances of improper and inadequate maintenance of the engines and fuel system. The fuel system contained corrosion debris, and minimal fuel was found in the lines to the fuel servo. Although maintenance was conducted on the airplane on the morning of the accident, the right engine fuel injectors nozzles were not removed during the maintenance procedures; therefore, it is likely that the fuel flow volume was not measured.

It is likely that the corrosion debris in the fuel system resulted when the water was recently purged from the fuel system. The contaminants were likely knocked loose during the subsequent engine runs and attempted takeoff, which subsequently blocked the fuel lines and starved the right engine of available fuel.

Probable Cause and Findings

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

The loss of right engine power due to fuel starvation, which resulted from corrosion debris in the fuel lines. Contributing to the accident was the mechanic's and pilot's inadequate maintenance of the airplane before the flight.

Findings

Aircraft	(general) - Fatigue/wear/corrosion
Aircraft	Fuel - Not specified
Personnel issues	(general) - Maintenance personnel

Factual Information

History of Flight

Takeoff	Fuel contamination
Takeoff	Fuel starvation
Takeoff	Loss of engine power (total) (Defining event)
Landing	Off-field or emergency landing

On July 20, 2018, about 1430 central daylight time, a Piper PA60 Aerostar airplane, N327BK, experienced a loss of engine power and landed in a field after takeoff from Baton Rouge Metropolitan Airport (BTR), Baton Rouge, Louisiana. The commercial pilot and one passenger were not injured and the airplane sustained substantial damage. The airplane was registered to and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a maintenance test flight. Visual meteorological conditions prevailed at the time of the accident and no flight plan had been filed. The local flight was departing at the time of the accident.

A review of the air traffic control recording revealed that the pilot requested to takeoff from runway 31 and fly one time around the traffic pattern for a maintenance check. The air traffic controller stated that the airplane dropped below the tree line after takeoff and was unable to reach the pilot on the radio.

After the accident the pilot stated that he completed a preflight inspection about 1400, then boarded the airplane and started both engines. While holding short of runway 31, he performed a pre-takeoff check of the airplane including a run-up for each engine with no anomalies noted. During the takeoff roll he advanced the throttles to takeoff power, then rotated. Shortly after rotation he noticed the right engine was not producing full power and the engine speed was decreasing. With no remaining runway available to land, he continued and looked for an off-field landing location. He retracted the landing gear and feathered the right propeller. The airplane was unable to maintain altitude so the pilot made a hard forced landing to a grass-covered field (figure 1) about 1 mile northwest of the departure end of runway 31.



Figure 1 – Accident airplane

In a postaccident statement, the mechanic who maintained the airplane stated that on the morning of the accident the right engine was unable to start. He examined the airplane and found the fuel system contaminated with water. The owner and mechanic then examined the left engine. They removed and cleaned the left engine fuel injector nozzles using an ultrasonic cleaner, purged the left fuel tank, removed the fuel line at the flow divider, and flushed the left fuel tank with the electric boost pump. The fuel line was reconnected then checked the fuel flow by measuring the fuel volume at each nozzle; about 3 ounces was recovered per nozzle. The nozzles were reinstalled and an engine ground run was completed with no anomalies noted. Next, they completed the same procedures to flush the fuel system and flow check the fuel nozzles for the right engine. The mechanic stated that the fuel nozzles were not removed on the right engine, but the fuel flow volume was the same as the left engine. No water or other contamination was found in the right engine or fuel lines. An engine ground run was completed with no anomalies noted. The mechanic reported that the pilot stated he was going to "take it around the patch." The pilot ordered fuel from the FBO and proceeded with his preflight.

The mechanic provided copies of the airplane's recent maintenance records. The most recent maintenance entry was completed by the mechanic on June 18, 2018, which involved reinstallation of an overhauled fuel injection servo and the fuel injector nozzles were cleaned; an engine ground run was completed with no discrepancies noted with the left engine. The records revealed that the airplane had accumulated 31.4 hours since July 2014, 3.6 hours since October 2017, and 10.8 hours since September 2016. During that time an annual inspection was completed each year by the same mechanic.

A postaccident examination of the engines and fuel system was completed by a third-party mechanic under the supervision of a Federal Aviation Administration (FAA) inspector. The examination revealed

no apparent external damage to either engine case or accessories. The fuel supply lines to the fuel servos on both engines appeared clean and exhibited a blue tint consistent with 100 low lead aviation fuel. The amount of fuel retrieved from the fuel supply line and fuel servo corresponding to each engine was not measured but was estimated that less than 5 milliliters of fuel was drained from each fuel servo supply line. The fuel sump drains in the left and right fuel tanks were corroded and unable to move. The cockpit engine controls were stiff but moved through their full range of travel when actuated by hand.

A borescope examination revealed that the left engine piston faces were generally clean and free from deposits, erosion or signs of fouling. The fuel flow divider cover was not safety wired. The No. 6 cylinder lower spark plug wire connector was only hand tight. The No. 1 cylinder top spark plug was over torqued and the electrode was fouled. The spark plugs corresponding to cylinder Nos. 2, 4, and 6 were under torqued. The No. 3 cylinder top spark plug was fouled and the bottom spark plug was both fouled and improperly gapped. The No. 5 cylinder bottom plug was improperly gapped. Improper hardware was used to secure the fuel injector lines between the flow divider and the cylinders. The exhaust gasket on cylinder No. 6 showed signs of failure and leakage. A borescope examination showed that the No. 3 exhaust valve would not seat properly. The fuel servo screen appeared new with a new gasket and no contamination noted. Fuel from the servo supply line was clean; however, fuel coming out of the servo was orange in color. A cold engine compression test was performed for each cylinder with a max pressure of 80 psi; the left engine compression values were 58/13/20/12/60/66 psi.

The right engine piston faces exhibited signs of fouling, carbon deposits, and erosion on the edges of the valve recesses. All spark plugs were improperly torqued. No. 6 cylinder exhaust gasket was blown. Cylinder Nos. 2 and 3 were lead fouled with large chunks of debris lodged between the case and insulator. The fuel servo screen contained contamination and was corroded. The fuel flow divider contained 2 pieces of corroded debris in the plunger orifice; the pieces of debris were almost the size of a BB. Corrosion debris was found in the 45-degree inlet fitting on the fuel flow divider. Standing oil was found in the No. 2 cylinder with the bottom spark plug oil soaked. The throttle cable was improperly installed, exhibited excessive bends, and the swaged end guide was found separated from the throttle body. A cold engine compression test was performed for each cylinder with a max pressure of 80 psi; the right engine compression values were 60/72/25/45/22/60 psi.

Pilot Information

Certificate:	Commercial	Age:	81,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	4-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	June 22, 2018
Occupational Pilot:	No	Last Flight Review or Equivalent:	December 14, 2017
Flight Time:	28829 hours (Total, all aircraft), 600 hours (Total, this make and model), 36 hours (Last 90 days, all aircraft)		

Passenger Information

Certificate:		Age:	Male
Airplane Rating(s):		Seat Occupied:	Right
Other Aircraft Rating(s):		Restraint Used:	4-point
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Smith	Registration:	N327BK
Model/Series:	Aerostar601	Aircraft Category:	Airplane
Year of Manufacture:	1973	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	61-0145-076
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	October 1, 2017 Annual	Certified Max Gross Wt.:	5500 lbs
Time Since Last Inspection:	5 Hrs	Engines:	2 Reciprocating
Airframe Total Time:	1912.2 Hrs at time of accident	Engine Manufacturer:	Lycoming
ELT:	C91A installed, not activated	Engine Model/Series:	IO-540-S1A5
Registered Owner:		Rated Power:	290
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:	KBTR, 76 ft msl	Distance from Accident Site:	1 Nautical Miles
Observation Time:	14:53 Local	Direction from Accident Site:	119°
Lowest Cloud Condition:		Visibility	10 miles
Lowest Ceiling:		Visibility (RVR):	
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	230°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.86 inches Hg	Temperature/Dew Point:	35°C / 23°C
Precipitation and Obscuration:			
Departure Point:	Baton Rouge, LA (BTR)	Type of Flight Plan Filed:	None
Destination:	Baton Rouge, LA (BTR)	Type of Clearance:	VFR
Departure Time:	14:29 Local	Type of Airspace:	Air traffic control; Class C

Airport Information

Airport:	Baton Rouge Metropolitan, Ryan BTR	Runway Surface Type:	Asphalt
Airport Elevation:	69 ft msl	Runway Surface Condition:	Dry; Vegetation
Runway Used:	31	IFR Approach:	None
Runway Length/Width:	7005 ft / 150 ft	VFR Approach/Landing:	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	1 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None	Latitude, Longitude:	30.545555, -91.164718(est)

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Michael Barrow; Federal Aviation Administration; Baton Rouge, LA
Original Publish Date:	November 6, 2019
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=97847

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](#).