



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Forsyth, MO	<b>Accident Number:</b>	CEN14LA112
<b>Date &amp; Time:</b>	01/03/2014, 1949 CST	<b>Registration:</b>	N4505Z
<b>Aircraft:</b>	PIPER PA-22-108	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	2 None
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Personal		

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## Analysis

The pilot reported that, while in cruise flight, the airplane experienced a total loss of engine power about 8 miles from the intended destination. The pilot was unable to restart the engine, and he subsequently ditched the airplane in a lake. A postaccident examination of the engine did not reveal any mechanical anomalies that would have prevented normal operation. No fuel was found in the fuel system during the postaccident examination; however, the airplane had been submerged for nearly 1 week before it was recovered from the lake.

Postaccident performance calculations indicated that it is likely that the engine lost power due to fuel exhaustion during the accident flight. Although the pilot reported that he had completed preflight planning calculations (the actual paperwork was lost during the accident), the investigation determined that the wind aloft values that the pilot likely used in his preflight planning calculations were significantly different from the actual wind aloft values. As a result, the airplane's actual ground speed was significantly less than what the pilot would have anticipated. The pilot also reported that he completed the accident flight at less than 65-percent engine power, which would have increased the length of the flight and the amount of fuel used during it when compared to higher engine power settings; the available cruise performance charts lacked true airspeed and engine speed data for operating below 65-percent engine power. Therefore, the pilot could not have estimated the total flight time and fuel required for the accident flight with a high level of accuracy. Additionally, the pilot reported that the mixture control cable had fractured during a previous flight and, to continue his cross-country trip, he safety-wired the carburetor mixture control arm in the full-rich position. As a result, the pilot was unable to properly lean the fuel mixture during the accident flight; however, it is unknown to what extent the pilot planned for this condition. Further, the pilot made an unplanned stop at an airport located along his planned route of flight. The additional fuel consumed during this unplanned stop (taxi, engine run-up, takeoff, and climb to cruise altitude) would have further reduced the amount of fuel available to complete the accident flight.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:  
The pilot's improper flight planning, which resulted in a total loss of engine power due to fuel exhaustion.

## Findings

Aircraft	Fuel - Fluid level (Cause)
Personnel issues	Fuel planning - Pilot (Cause)

## Factual Information

On January 3, 2014, at 1949 central standard time, a Piper model PA-22-108 airplane, N4505Z, was substantially damaged during a forced landing near Forsyth, Missouri. The pilot and passenger were not injured. The airplane was registered to and operated by the pilot, under the provisions of 14 Code of Federal Regulations Part 91, without a flight plan. Night visual meteorological conditions prevailed for the cross-country flight, which departed Sullivan Regional Airport (UUV), Sullivan, Missouri, at 1700 and was en route to M. Graham Clark Downtown Airport (PLK), Branson, Missouri.

The pilot reported that the mixture control cable had fractured during a previous flight, and to continue on his cross-country trip he safety-wired the carburetor mixture control arm in the full-rich position. Fueling records, obtained from the airport management at UUV, indicated that the airplane had been fueled with 11.49 gallons of Avgas at 1630. The pilot stated that he flew at a cruise altitude between 2,500 and 3,000 feet mean sea level (msl) to the intended destination. However, while en route, he decided to make an unplanned stop at Ava Bill Martin Memorial Airport (AVO) to use the restroom facility. The pilot estimated that the duration of the ground stop was 15-30 minutes before the flight had departed again for PLK.

The pilot reported that while in cruise flight about 8 miles northeast of PLK, between 2,500 and 3,000 feet msl, the airplane suddenly experienced a total loss of engine power and the propeller began to windmill. The engine did not restart after he verified that the magneto switch and fuel selector were both on. He stated that his attention was then focused on finding a suitable area to perform a forced landing. The nearby roads contained curves and the surrounding terrain was hilly, so he decided to ditch the airplane in Bull Shoals Lake, located near Forsyth, Missouri. After landing in the lake, he and his passenger were able to swim to the shoreline where they were treated by first responders for symptoms of hypothermia. The pilot and his passenger were not physically injured during the accident. The airplane sunk following the ditching and remained submerged for nearly one week before it was recovered. Upon recovery from the lake, the airplane exhibited substantial damage to the engine firewall.

A postaccident examination of the wreckage established that there were no mechanical discontinuities within the engine drivetrain, valve train, or the accessory section. All four cylinders produced compression/suction while the engine crankshaft was rotated. The mixture control cable was found broken, and the carburetor mixture control arm was found safety-wired in the full-rich position. Both magneto assemblies exhibited water contamination and were allowed to air dry over a period of two days. After being air dried, both magnetos provided spark through each ignition lead wire to its respective spark plug. No fuel was located in the airplane fuel system; however, the airplane had been submerged in water for nearly one week.

A direct flight from UUV to PLK is 158.6 statute miles on a 226 degree true course. The pilot reported that the airplane typically achieved a cruise speed between 105-115 miles per hour (mph) while at a cruise altitude of 2,500-3,000 feet msl. Without any wind considerations, the non-stop direct flight between UUV and PLK would have taken between 1 hour 23 minutes and 1 hour 31 minutes, at 115 mph and 105 mph respectively. However, upper atmosphere wind modeling suggested that the wind aloft averaged 45 mph from 195 degrees at the cruise altitudes used during the accident flight.

According to the Piper PA-22-108 Owner's Handbook performance charts, at 3,000 feet msl and 75-percent engine power, the fuel consumption rate would be 7.8 gallons per hour (full-

rich mixture) at a true airspeed of 112 mph. At 3,000 feet and 65-percent engine power, the fuel consumption rate would be 7.2 gallons per hour (full-rich mixture) at a true airspeed of 104 mph.

Performance calculations established that with the expected wind aloft, the non-stop direct flight, at 75-percent engine power, would have taken 2 hours and 14 minutes at a ground speed of 71 mph and used 17.4 gallons of fuel. That same flight, completed at 65-percent engine power, would have taken 2 hours and 31 minutes at a ground speed of 63 mph and used 18.125 gallons of fuel.

The accident airplane was equipped with a single 18 gallon fuel tank, of which 16.875 gallons were considered usable. The airplane landing gear configuration had been modified from a tricycle assembly into a conventional tail wheel; however, there was no available flight data to indicate how the lack of a nose gear would affect the airplane's overall cruise performance.

The pilot reported that he had completed flight planning calculations before departing on the accident flight; however, the actual paperwork that he used was lost and/or destroyed during accident. The pilot stated that the upper wind models that he was provided during the accident investigation were significantly higher than what he remembered planning for. Additionally, the pilot reported that he completed the accident flight at an engine speed of 2,250 rpm, which according to available performance charts was less than 65-percent engine power.

Furthermore, the available cruise performance charts lacked true airspeed and engine speed data below 65-percent engine power.

## History of Flight

<b>Enroute-cruise</b>	Fuel exhaustion Loss of engine power (total) (Defining event)
<b>Landing</b>	Off-field or emergency landing Ditching

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	56
<b>Airplane Rating(s):</b>	Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 3 Without Waivers/Limitations	<b>Last Medical Exam:</b>	08/05/2013
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	03/26/2013
<b>Flight Time:</b>	160 hours (Total, all aircraft), 18 hours (Total, this make and model), 100 hours (Pilot In Command, all aircraft), 30 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

Aircraft Manufacturer:	PIPER	Registration:	N4505Z
Model/Series:	PA-22-108	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	22-8006
Landing Gear Type:	Tailwheel	Seats:	2
Date/Type of Last Inspection:	05/11/2013, Annual	Certified Max Gross Wt.:	1650 lbs
Time Since Last Inspection:	24 Hours	Engines:	1 Reciprocating
Airframe Total Time:	2531 Hours	Engine Manufacturer:	Lycoming
ELT:	C91 installed, not activated	Engine Model/Series:	O-235-C1B
Registered Owner:	On file	Rated Power:	108 hp
Operator:	On file	Air Carrier Operating Certificate:	None

## Meteorological Information and Flight Plan

Observation Facility, Elevation:	BBG, 1302 ft msl	Observation Time:	1945 CST
Distance from Accident Site:	10 Nautical Miles	Condition of Light:	Night
Direction from Accident Site:	206°	Conditions at Accident Site:	Visual Conditions
Lowest Cloud Condition:	Clear	Temperature/Dew Point:	-2° C / -11° C
Lowest Ceiling:	None	Visibility	10 Miles
Wind Speed/Gusts, Direction:	12 knots/ 18 knots, 150°	Visibility (RVR):	
Altimeter Setting:	30.06 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Sullivan, MO (UUV)	Type of Flight Plan Filed:	None
Destination:	Branson, MO (PLK)	Type of Clearance:	None
Departure Time:	1700 CST	Type of Airspace:	Class G

## 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		

## Administrative Information

**Investigator In Charge (IIC):** Andrew T Fox **Adopted Date:** 04/23/2014

**Additional Participating Persons:** Rod McLaughlin; Federal Aviation Administration; Kansas City, MO

**Publish Date:** 04/23/2014

**Investigation Docket:** <http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=88672>

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