



National Transportation Safety Board Aviation Accident Final Report

Location:	Cumberland, RI	Accident Number:	NYC08LA299
Date & Time:	09/01/2008, 0830 EDT	Registration:	N5529J
Aircraft:	PIPER PA-32-260	Aircraft Damage:	Substantial
Defining Event:	Fuel starvation	Injuries:	1 None
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The owner/pilot departed in the single-engine airplane for the personal cross-country flight. He climbed to and set the power for a cruise altitude of 7,500 feet, and noted that his digital engine monitor indicated an engine speed of 2,300 rpm. Shortly thereafter, without any unusual noises or vibration, the engine speed decreased to 1,100 rpm, the manifold pressure appeared unchanged, and the airplane started to descend. The pilot exercised the propeller control to increase the rpm, but there was no response to his inputs. He declared an emergency, and attempted to divert to a nearby airport, but then elected to perform an off-airport landing in a field. During the rollout, the airplane struck bushes and trees that bordered the field. The pilot received minor injuries, and there was no fuel spill. Post-accident examination of the airplane revealed that the two inboard fuel tanks were full, the right outboard contained several gallons, and the left outboard tank contained only trace amounts of fuel. The fuel selector valve was reset to one of the main tanks; the engine started readily, and ran normally. Engine monitor data showed that during the flight, combustion had ceased, but the propeller continued to windmill during the 6 minutes of the descent. The pilot did not recognize the power loss, and misdiagnosed it as a propeller problem, and did not continue his trouble-shooting to positively identify and correct the underlying problem. In addition, the pilot's fuel management procedures were not in compliance with the procedures specified in the airplane manufacturer's operating manual. It stated that, "...If time permits," the pilot should manipulate the throttle and fuel selector in a continued attempt to restore engine power. Below that, a note stated "...If engine power was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which may require up to ten seconds...."

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's improper fuel management practices, which resulted in fuel starvation and a complete power loss. Contributing to the accident was the pilot's misdiagnosis of the situation, and his cessation of trouble-shooting to positively identify and correct the underlying problem.

Findings

Aircraft	Fuel distribution - Incorrect use/operation Fuel - Fluid management (Cause)
Personnel issues	Use of equip/system - Pilot (Cause) Use of policy/procedure - Pilot (Cause) Identification/recognition - Pilot (Factor) Use of checklist - Pilot
Environmental issues	Tree(s) - Contributed to outcome

Factual Information

HISTORY OF FLIGHT

On September 1, 2008, about 0830 eastern daylight time, a Piper PA-32-260, N5529J, was substantially damaged during a forced landing in a field near Cumberland, Rhode Island. The pilot/owner was uninjured. The personal flight was operated under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed, and no flight plan was filed.

According to the pilot, he added a quart of oil to the engine prior to the flight. He then departed Theodore Francis Green State Airport (PVD), Providence, Rhode Island, about 0750, for his intended destination of Mount Washington Regional Airport (HIE), Whitefield, New Hampshire. The pilot contacted the Federal Aviation Administration (FAA) Boston air traffic control (ATC) facility for flight following services, and climbed to an indicated cruise altitude of 7,500 feet above mean sea level (msl). He leaned the mixture for cruise, and his digital engine monitor indicated an engine speed of 2,300 rpm.

At some point just outside the Boston Class B airspace, the engine speed decreased to approximately 1,100 rpm, and the airplane slowed, and started to descend. The pilot did not hear any unusual noises, or feel any unusual vibrations, prior to the rpm decrease. He exercised the propeller control to increase the rpm, but there was no response to his inputs. The pilot noted a manifold pressure (MP) of approximately 22 1/2 inches.

The airplane continued to lose altitude. The pilot radioed Boston ATC, waited approximately 20 to 30 seconds, but did not receive a response. He then declared an emergency, and in response, Boston ATC informed the pilot of the two airports closest to his current position. The pilot was familiar with one of them, North Central State Airport (SFZ), Pawtucket, Rhode Island, so he opted for that, even though it was behind him. He turned the airplane to the south, and acquired the airport visually. The pilot attempted to maintain the airplane's recommended best glide speed during the descent. At some point during the descent, Boston ATC requested the pilot to switch communications to Providence ATC, and the pilot complied with the request.

When the airplane was at approximately 2,800 feet msl, the pilot determined that he was not going to reach the intended diversion airport. He spotted a field to the east of his position that appeared suitable for an off-airport landing, and headed for that field. In preparation for the off-airport landing, at an altitude of approximately 2,500 feet msl, the pilot switched the fuel selector valve to the "OFF" position, and shut off all the airplane's electrical systems. The pilot slipped the airplane in a steep descent from an altitude of approximately 2,200 feet msl, in order to place the airplane in a position for landing on the field. The touchdown was "fine," but during the rollout, the airplane struck bushes and trees that bordered the field. There was no fuel spill, and no fire.

PERSONNEL INFORMATION

According to FAA records, the pilot held a private pilot certificate, with an airplane single-engine land rating. The pilot reported 550 total hours of flight experience on his most recent application for an FAA third-class medical certificate, which was issued in January, 2008. His most recent flight review was completed in April, 2007.

Examination of the pilot's logbook that was provided to the investigation indicated that he had approximately 255 total hours of flight experience, including approximately 62 hours in the accident airplane make and model, all of which was in the accident airplane. In subsequent communications, the pilot stated that his records showed that he had 580 hours total time, including approximately 385 hours in the accident airplane.

AIRPLANE INFORMATION

The airplane was manufactured in 1968. It was a low-wing monoplane with fixed tricycle-style landing gear. It was equipped with a Lycoming O-540 series piston engine and a constant-speed propeller. The airplane was registered to the pilot in June 2005. According to the maintenance records, the most recent annual inspection was completed in January 2008, at which time the airplane had 4,952.2 total hours in service.

METEOROLOGICAL INFORMATION

The 0835 surface weather observation at SFZ, located approximately 5 miles from the accident location, reported winds from 320 degrees at 8 knots, visibility 10 miles, clear skies, temperature 18 degrees C, dew point 11 degrees C, and an altimeter setting of 30.14 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The airplane landed in a grassy field located approximately 5 1/2 miles northeast of SFZ. According to the FAA inspector who responded to the accident, the airplane was removed from the vegetation and visually examined. None of the vegetation displayed any cuts consistent with being struck by a rotating propeller. The inboard leading edge of the right wing sustained minor damage, and the outboard section of the left wing sustained significant damage. The left wing was rotated about 5 degrees in the horizontal plane, in a direction that displaced the wing tip aft of its original position. None of the fuel tanks or fuel lines was breached. The two inboard fuel tanks were full, the right outboard tank was "more than half" full, and the left outboard tank contained only trace amounts of fuel. The fuel selector valve was found in the "OFF" position. Only about 1 1/2 ounces of fuel were able to be obtained from the carburetor bowl via the drain plug.

ADDITIONAL INFORMATION

Airplane Fuel System and Procedures

The fuel system schematic in the airplane manufacturer's Owner's Handbook (OH) indicated that the airplane was equipped with four separate fuel tanks. Each wing had a 25-gallon capacity main tank, and a 17-gallon capacity tip tank, and each fuel tank was equipped with a dedicated fuel quantity gauge in the cockpit. Each tank was plumbed directly to the fuel selector valve, which enabled a pilot to select only one fuel tank to supply the engine at any given time. The fuel selector valve was also equipped with an "OFF" setting, which prevented fuel from being supplied to the engine.

The OH stated that "takeoff should be made on the tank with the highest quantity of fuel." For cruise flight, the OH stated that "In order to keep the airplane in best lateral trim during cruise, the fuel should be used alternately from each main tank, and when they 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 be used until nearly exhausted, then return to the first main tank. When exhausted, turn to one tip tank and alternate at one-half hour intervals to maintain lateral

trim."

Engine Data Monitor

The airplane was equipped with a JPI Instruments model EDM-800 engine monitor that was mounted in the cockpit, and provided both digital and analog graphic displays of multiple engine parameters. According to the manufacturer, "the EDM will monitor up to twenty-four critical parameters in your engine, four times a second, with an accuracy of better than 2 [degrees] Fahrenheit." EDM 800 parameters included exhaust gas temperature (EGT) and cylinder head temperature (CHT) for each cylinder, fuel flow, engine rpm, manifold pressure and percent horsepower being developed. The monitor started automatically and operated continuously whenever electrical power was applied on the airplane; it did not require any pilot action to initiate, or to display the information during flight. The monitor was equipped with non-volatile memory which permitted the recording and storage of engine parameters from multiple flights.

The EDM-800 was removed from the airplane, and provided to the National Transportation Safety Board recorder's laboratory in order to retrieve the recorded information from the accident flight. The data indicated that approximately 30 minutes into the flight, the EGT, CHT and other engine parameters were consistent with normal engine operation in cruise flight. Just prior to the rpm loss, when the engine was operating at 2,200 rpm and 22 inches of MP, the EGT values were approximately 1,300 degrees F, and the CHT values were approximately 340 degrees F. At an EDM-indicated time of 1330:10, the rpm began to decrease, and 1 minute later, the rpm was approximately 1,200. The EGT values decreased approximately 1,000 degrees F during that same period. The CHT values decreased 150 degrees F, over a period of 3 minutes. The MP did not change appreciably, and began to increase as the airplane descended.

Owner's Handbook Procedures: Engine Power Loss in Flight

The OH Emergency Procedures chapter contained a section entitled "Engine Power Loss in Flight," and the section contained the following discussion and guidance: "Complete engine power loss is usually caused by fuel flow interruption, and power will be restored after fuel flow is restored...Maintain an airspeed of at least 100 mph, and if altitude permits, proceed as follows."

The OH then presented a two-section checklist for the pilot to use to attempt to restore power. The first item in the first section was "Fuel Selector- Switch to another tank containing fuel," and the second was "Electric Fuel Pump - On." The fourth checklist item was "Engine Gauges - Check for an indication of the cause of power loss," and the seventh item was "If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel." After the seventh item, the checklist provided two items to be conducted "When power is restored."

The second section of the checklist was contained under the heading "If time permits," and the last two items instructed the pilot to manipulate the throttle and fuel selector in a continued attempt to restore engine power. Below that, a note stated "If engine power was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which may require up to ten seconds."

Post Accident Engine Run

After the airplane was removed from the vegetation and examined, the FAA attempted to run

the engine. The fuel selector valve was set to one of the main tanks, and the engine started readily, and ran normally. The propeller appeared to respond correctly to the control inputs, and no mechanical or operational anomalies were noted with either the engine or the propeller. The engine was shut down, the carburetor was drained again, and approximately 9 to 10 ounces of fuel were obtained from the carburetor bowl via the drain plug.

Additional Pilot-provided Information

In one written statement provided by the pilot, he stated that when he checked the fuel tanks during his pre-flight inspection, the two main tanks were full, and each tip tank contained approximately 3 to 4 gallons, for a takeoff fuel quantity of approximately 56 to 58 gallons. Also in a written statement, the pilot indicated that he "did [the] emergency checklist - couldn't get prop to work," but he did not explicitly note which checklist he executed, and he did not mention any actions related to the fuel system. None of the pilot's written statements contained any information regarding which fuel tank he used for takeoff, climb or cruise, or whether he switched fuel tanks at any point in the flight. The statements did not provide any information regarding whether, in response to the rpm loss, and while still airborne, the pilot checked the fuel quantities in the various tanks, or switched tanks using the fuel selector valve.

In verbal discussions with investigators, the pilot stated that prior to the flight preceding the accident flight, he topped off all four fuel tanks in Bar Harbor, Maine, and then flew to PVD. He said that this flight was approximately 2 hours in duration, and that he utilized fuel from the tip tanks for the flight. Regarding the accident flight, the pilot believed that he took off from PVD using the right main tank, and that he did not change the fuel selector valve position during the flight. He also stated that he did not manipulate the throttle or the fuel selector valve immediately after the rpm loss, or during the ensuing descent. In addition, the pilot noted that during the flight, he wore a Lightspeed brand model 15-XL noise cancelling headset, and that when the rpm loss occurred, he did not note any change in engine sound. Approximately 6 weeks after the event, the pilot told investigators that he concluded that "perhaps" he might have been "too calm" about the situation, which might have resulted in the fact that he "abandoned problem solving" too soon to permit positive identification and correction of the cause for the rpm loss.

History of Flight

Enroute-cruise	Fuel starvation (Defining event)
	Loss of engine power (total)

Pilot Information

Certificate:	Private	Age:	58, Male
Airplane Rating(s):	Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	None	Second Pilot Present:	
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 With Waivers/Limitations	Last Medical Exam:	01/31/2008
Occupational Pilot:	No	Last Flight Review or Equivalent:	04/01/2007
Flight Time:	580 hours (Total, all aircraft), 385 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	PIPER	Registration:	N5529J
Model/Series:	PA-32-260	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:		Serial Number:	
Landing Gear Type:		Seats:	
Date/Type of Last Inspection:		Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	Reciprocating
Airframe Total Time:		Engine Manufacturer:	Lycoming
ELT:	Not installed	Engine Model/Series:	O-540 SERIES
Registered Owner:	Tri-Radial Flyers	Rated Power:	260 hp
Operator:	Tri-Radial Flyers	Air Carrier Operating Certificate:	None

Meteorological Information and Flight Plan

Observation Facility, Elevation:	SFZ	Observation Time:	0835
Distance from Accident Site:		Condition of Light:	
Direction from Accident Site:		Conditions at Accident Site:	Visual Conditions
Lowest Cloud Condition:	Clear	Temperature/Dew Point:	18°C / 11°C
Lowest Ceiling:	None	Visibility	10 Miles
Wind Speed/Gusts, Direction:	8 knots, 320°	Visibility (RVR):	
Altimeter Setting:	30.14 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:			
Departure Point:	Providence, RI (PVD)	Type of Flight Plan Filed:	None
Destination:	Cumberland, RI (SZF)	Type of Clearance:	
Departure Time:	0000 EDT	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 None		

Administrative Information

Investigator In Charge (IIC):	Michael C Huhn	Adopted Date:	03/23/2010
Additional Participating Persons:	Henrique Mendes; FAA/FSDO; Boston, MA		
Publish Date:	03/23/2010		
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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.