Aviation Investigation Final Report

Location:	Mitchell, Oregon	**Accident Number:**	WPR10LA001
Date & Time:	October 2, 2009, 12:40 Local	**Registration:**	N1621C
Aircraft:	Cessna 180	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Serious, 1 Minor, 1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The single engine airplane experienced a loss of engine power during flight and the pilot performed a forced landing in rugged terrain. Examination of the airplane wreckage revealed minimal evidence of fuel. The airplane had a modified fuel tank system through a supplemental type certificate (STC). The STC changed the fuel capacity of the two fuel tanks from 30 gallons to 28.2 gallons each. The installation information for the STC noted that to determine the usable fuel for the airplane, the airplane's type certificate data sheet (TCDS) should be referenced and the unusable fuel amount listed therein should be subtracted from the new total fuel capacity. The TCDS for the airplane stated that 5 gallons of fuel were unusable, which made the new total usable fuel capacity on the airplane 51.4 gallons. As a part of the STC, the airplane flight manual (AFM) and the fuel selector valve placard were to be updated with the revised usable fuel quantity. This action was noted on the FAA Form 337 for the STC installation. The pilot had purchased the airplane several years prior to the accident and the previous owner told him that all of the fuel (56.4 gallons) was usable. The pilot reported that there was no AFM supplement for the STC included in his paperwork, and that he did not ever look at the quantities indicated on the fuel selector valve placard in the cockpit due to its location between the seats. Examination of the recovered airframe and engine components revealed no evidence of preimpact mechanical malfunction.

Probable Cause and Findings

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

Findings

Personnel issues	Knowledge of equipment - Pilot
Aircraft	Fuel - Fluid management
Environmental issues	Rough terrain - Not specified

Factual Information

History of Flight

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

HISTORY OF FLIGHT

On October 2, 2009, about 1240 Pacific daylight time, N1621C, a Cessna 180, lost engine power during flight and the pilot performed a forced landing in rugged terrain near Mitchell, Oregon. The private pilot was operating the airplane under the provisions of Title 14 Code of Federal Regulations Part 91. The pilot sustained minor injuries, one passenger sustained serious injuries, and one passenger was not injured. The airplane was substantially damaged. Visual meteorological conditions prevailed and the pilot had requested and received flight following. The pilot departed about 1030 from Pistol Creek airstrip, a private airstrip in the Idaho backcountry, and was destined for Roberts Field Airport, Redmond, Oregon.

An Oregon State Trooper, who was also a private pilot, responded to the accident site. The trooper interviewed the pilot who reported that the engine lost power during the flight and then he force-landed the airplane. The Trooper documented the accident site and noted that the throttle, mixture, and propeller controls were in the full forward position. The flap lever was at 0 degrees. The fuel selector valve was positioned at “Both.” The magneto switch was in the off position. The trooper noted that the left wing was extensively damaged and the right wing was positioned vertically against a tree. He did not see fuel or smell the odor of fuel near either wing. The trooper also interviewed several hunters in the area that had witnessed the event. The witnesses reported that they were standing outside when they heard a popping noise. They looked up and saw the airplane fly overhead with no power. The airplane disappeared behind the trees prior to impact.

Pilot Statements

The pilot submitted several statements following the accident.

The first statement was received on October 15. He reported that prior to his original departure from Redmond, he requested that the fuel tanks be filled to “...within 1/2-inch of the necks and noted 23 gallons pumped on the truck meter.” He flew direct to Pistol Creek and used 1/3-1/2 carburetor heat for approximately 40 percent of the flight. The pilot estimated 10 gallons of fuel for each hour of flight. The pilot’s calculations showed that he had 58.2 gallons of fuel total in the airplane, and he had used 22.5 gallons with 35.7 gallons remaining. He had flown 2.25 hours. When the airplane was tied down at Pistol Creek, the pilot ensured that it was secured on level ground and checked to make sure that no fuel was dripping from the airplane.

When he departed from Pistol Creek, he circled around an area that he and one of his passengers had hunted in the previous year, and then flew direct to Redmond. The carburetor heat usage during the flight was similar to the first. The pilot indicated that he used a fuel burn rate of 10 gallons per hour for elapsed time, and 12.5 gallons per hour for tachometer time. At 4 hours and 20 minutes since the airplane had been refueled, the pilot's calculations showed that just under 15 gallons of fuel were remaining based on elapsed time, and 8.2 gallons of fuel were remaining based on tachometer time. The pilot estimated his reserve fuel upon landing would be between 5.2 to 11.5 gallons. Both tanks read about 1/8-fuel on the gages. He entered the airplane into a descent and about 5 minutes later, the engine lost power, dropping to idle, and would not respond to throttle. He immediately switched the fuel selector from the left tank to both, and there was no change. He then switched the selector to the right tank and the engine sputtered but then went back to idle. He then switched the selector to the both position where it remained. He pitched the airplane for best glide and saw two clearings. He attempted to land in one of the clearings but impacted trees near the end of the intended landing area. The pilot secured the airplane and did not see or smell any fuel. The pilot used his SPOT personal locator beacon to transmit several distress messages. He then climbed to the top of a hill in order to find cell service and reported the emergency. A search airplane located the accident site about 1 hour later.

The pilot was interviewed by the FAA on October 16. The pilot reported that upon passing John Day Airport en route to Redmond, the engine ceased operating while the fuel selector was on the left tank. The pilot stated that he immediately moved the selector to the right tank, the engine sputtered a few times, but it did not continue to operate. The pilot then positioned the fuel selector to both. During the interview, the pilot indicated that the fuel capacity on the airplane was 58 gallons due to a supplemental type certificate (STC) installation. The pilot then produced the STC paperwork for the FAA to review. The FAA then asked the pilot the amount of unusable fuel with this STC and the pilot stated that the previous owner told him that all 58 gallons were usable. The FAA noted that the actual usable fuel was 51.4 gallons. The FAA also showed the pilot the fuel selector decal that had been placarded with 51.4 gallons usable fuel. The pilot reported making the trip 8 to 9 times prior to the accident flight; however, the latest flight was the first time that he had not refueled in Idaho.

On October 28, the pilot submitted a letter to the FAA. He reported that he contacted the previous owner who told him that he had burned the fuel out of one of the tanks when the STC was first installed and determined that all of the fuel was usable. According to the pilot, the previous owner was also not aware of the placard on the fuel selector. The pilot reported that when he purchased the airplane, he went through all of the paperwork and did not find any information related to the usable fuel on the airplane other than the example provided in the installation instructions which referenced a Cessna 182. In addition, he reported that the airplane flight manual did not contain a supplement for the STC installation.

On November 16, the pilot submitted a written statement to the FAA maintaining that the fuel tanks installed held 56.4 gallons total of usable fuel and that the previous owner and he had operated successfully since 1990 using those capacities. The pilot also noted that the fuel

contained in the tanks may have been less than he presumed due to fueling errors (not filling the tanks as he requested), someone tampering with the fuel at Pistol Creek, and/or loss of fuel at the accident site. The pilot further stated that he was "...positive the prop continued to spin at least until such time as the collision with the tree...We clearly did not experience the silence of a stopped engine/prop."

Previous Owner Statement

The previous owner of the airplane was contacted. Following the supplemental type certificate (STC) fuel tank installation, he continued to plan on 55 gallons of usable fuel. He reported that generally, he would plan for 12.5 gallons per hour fuel burn. Sometimes the airplane would burn 13 gallons if he did not lean the mixture consistently. Normally he would not fly the airplane longer than 4 hours. He recalled one time where he put just over 50 gallons onboard and he thought that he "...cut it too close." The previous owner also stated that at one point he was doing some work on the left wing and he needed to drain the fuel tank. He flew over an airport and burned all of the fuel out of the wing tank. When he refueled it, it appeared that he had burned the entire fuel capacity (28.2 gallons) out of the wing. The previous owner could not recall an airplane flight manual supplement related to the fuel tank STC. He indicated that it may have had one but he could not remember. He indicated that all of the paperwork was provided to the new owner.

AIRPLANE HISTORY

The four-seat, single-engine airplane, serial number 30321, was manufactured in 1953 and was originally equipped with 30-gallon bladder fuel tanks in each wing. According to the FAA Airplane Airworthiness file for the airplane, in 1990, 28.2-gallon standard fuel tanks were installed in each wing under supplemental type certificate (STC) SA 2346CE. On the FAA Form 337 for the installation, it was noted that in addition to the airplane fuel tank changes, the airplane flight manual was also updated with supplements 1, 2, and 3.

According to STC SA2346CE, standard range 56 or 62-gallon capacity or long range 77-gallon capacity fuel tanks could replace the original bladder fuel tanks.

The instructions for the installation of the fuel tanks were recovered from the airplane maintenance records by the FAA accident coordinator. For the standard 28.2-gallon standard tanks, the instructions noted that existing placard data should be removed and that a placard stating "Capacity 28.2 Gal." should be installed. The instructions also said to correct the usable fuel valves on the fuel selector valve placard by obtaining the unusable fuel quantities from the type certificate data sheet (TCDS) for the applicable airplane. The unusable fuel quantity should then be subtracted from 56.4 gallons (28.2 each tank) to determine the usable fuel. These corrected quantities should then be noted on the fuel selector valve.

According to the TCDS for the accident airplane, the unusable fuel quantity is 5 gallons.

TESTS AND RESEARCH

The airframe was examined. The fuel placards showed 28.2 gallons capacity on each wing, and the fuel selector placard at the fuel selector valve in the cockpit showed 51.4 gallons usable in the both position, and 25.7 gallons usable for each tank. The right fuel cap remained intact and secured to the tank. The left cap upper portion had separated from the lower portion. The lower portion of the cap was able to be secured into the fuel tank. There was no evidence of fuel staining on either wing or the fuselage. The fuel selector was removed from the airplane and examined. The fuel screen for the left wing was free from obstruction. The fuel screen for the right wing was not located. Approximately 1 ounce of fuel was collected from the fuel line leading from the left tank to the fuel selector. The color and smell of the fuel were consistent with 100 low lead (LL). The left fuel tank had been breached. The right fuel tank remained intact. Both fuel tanks were identified with a Monarch label and manufacture date of November 13, 1990. The firewall fuel strainer was unobstructed and contained no fuel. The drain valve was closed but free to move to the open position.

The Teledyne Continental Motors O-470-J engine, serial number 41500, was examined. The engine was separated from the firewall and airframe. Several areas of impact damage were noted. Crushing was evident on the forward left side and at cylinder number 1. The upper spark plugs were removed from the cylinders and were considered worn out-normal when compared to a Champion Check-A-Plug chart. The cylinders were borescoped and had residual oil and white combustion deposits. The rocker arm covers were removed. Thumb compression was obtained on all six cylinders and the valves each produced similar amounts of lift. Mechanical gear continuity was obtained from the propeller to the starter drive pulley, propeller governor drive gear, and accessory case. The carburetor was removed and disassembled. No fuel was evident in the bowl. The carburetor floats were intact and the screen was clean. The propeller governor was removed. It was manually rotated and the screen was clean. The vacuum pump was removed and the drive coupler was intact. No fuel was evident at the engine. The Oberg oil filter contained oil and the screen was free from obstruction.

The McCauley propeller was examined. Both blades remained secured in the hub. Blade 1 had aft bending near the tip and scuffing along its leading edge. Blade 2 contained chordwise scratch marks on its trailing edge.

Examination of the recovered airframe and engine components revealed no evidence of preimpact mechanical malfunction.

Pilot Information

Certificate:	Private	**Age:**	55,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
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:**	December 1, 2008
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	June 19, 2009
Flight Time:	824 hours (Total, all aircraft), 274 hours (Total, this make and model), 724 hours (Pilot In Command, all aircraft), 42 hours (Last 90 days, all aircraft), 23 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N1621C
Model/Series:	180	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal; Utility	**Serial Number:**	30321
Landing Gear Type:	Tailwheel	**Seats:**	4
Date/Type of Last Inspection:	August 28, 2009 Annual	**Certified Max Gross Wt.:**	2650 lbs
Time Since Last Inspection:	22 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4825 Hrs at time of accident	**Engine Manufacturer:**	Teledyne Continental Motors
ELT:	C91 installed, activated, aided in locating accident	**Engine Model/Series:**	O-470-J
Registered Owner:	Tailwheel Excursion LLC	**Rated Power:**	230 Horsepower
Operator:	William Gonce	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	RDM,3080 ft msl	**Distance from Accident Site:**	63 Nautical Miles
Observation Time:	12:56 Local	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	5000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 5000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	12 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	13°C / 1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Pistol Creek, ID (PVT)	**Type of Flight Plan Filed:**	None
Destination:	Redmond, OR (RDM)	**Type of Clearance:**	VFR flight following
Departure Time:	10:30 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious, 1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 1 Minor, 1 None	**Latitude, Longitude:**	44.353054,-119.879165(est)

Administrative Information

Investigator In Charge (IIC):	Dunks, Kristi
Additional Participating Persons:	Marty Conroy; Federal Aviation Administration; Portland, OR Andrew Swick; Teledyne Continental Motors; Sacramento, CA Jan Miller; Cessna Aircraft Company; Wichita, KS
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