Aviation Investigation Final Report

Location:	Pottstown, Pennsylvania	**Accident Number:**	ERA16LA126
Date & Time:	March 9, 2016, 13:10 Local	**Registration:**	N242TS
Aircraft:	Mooney M20	**Aircraft Damage:**	Substantial
Defining Event:	Fuel contamination	**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The accident flight was the airplane's first since its annual inspection, which had just been completed. According to the pilot, because the airplane had just undergone an annual inspection, he completed a thorough preflight inspection, including checking and draining fuel from the fuel sumps. The pilot stated that, after the preflight, he then started the engine and completed two runups before taxiing to the runway for takeoff.

According to witnesses and the pilot, the airplane's takeoff was normal. The pilot reported that everything appeared to be normal until reaching 300 to 400 ft above ground level (agl), when the engine suddenly stopped producing power. A witness reported hearing the engine "cut out" then "surge." The witness also stated that the airplane began a right turn about 300 ft agl and appeared to stop climbing at this point while the turn appeared to become steeper. The pilot stated that he knew he would not be able to safely return to the airport and veered the aircraft to the right to avoid any property or people who might have been straight ahead, aiming for the grassy area just to north side of the runway, where the airplane struck the ground and came to rest.

Examination of the airplane and engine revealed no evidence of any preimpact failures or malfunctions that would have precluded normal operation. However, examination of the fuel system revealed the presence of water in the fuel system and carburetor float bowl, which likely caused the engine power loss.

The mechanic who performed the airplane's most recent annual inspection reported completing several static power engine runups the day before the accident; the engine produced power during each runup, and he did not note any abnormalities. He stated that the airplane had been at the airport for about 2 weeks before the accident flight and was subject to several heavy rain events during that period. He also stated that the airplane had not been refueled since it had arrived at the airport for maintenance. Review of fuel provider records from the location of the airplane's last known refueling did not reveal any evidence of contamination of the fuel provider's fuel supply.

The owner's airplane manual stated that the fuel sumps should be drained as part of the preflight inspection. It is likely that the pilot rushed or did not perform the preflight, as water was discovered in the fuel system.

Probable Cause and Findings

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

The pilot's inadequate preflight inspection, which resulted in a total loss of engine power due to fuel contamination and a subsequent off-airport landing.

Findings

Personnel issues	Preflight inspection - Pilot
Aircraft	Fuel - Inadequate inspection
Aircraft	Fuel - Fluid condition

Factual Information

History of Flight

Prior to flight	Preflight or dispatch event
Initial climb	Fuel contamination (Defining event)
Emergency descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On March 9, 2016, about 1309 eastern standard time, a Mooney M20C airplane, N242TS, was substantially damaged when it was involved in an accident near Pottstown, Pennsylvania. The pilot was seriously injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to the pilot, the accident flight was the airplane's first after having just undergone an annual inspection, performed by Heller Aero Services at Heritage Field Airport (PTW), Pottstown, Pennsylvania. According to the pilot, he completed a thorough preflight inspection, including checking and draining the fuel from the fuel sumps. The pilot stated that, after the preflight, he then started the engine and completed two runups before taxiing to runway 28 for takeoff. According to witnesses, after starting the engine, the pilot was observed to shut the engine off, exit the airplane, remove the wheel chocks, and get back into the airplane. Witnesses reported that the pilot then started the airplane and began to taxi.

The pilot stated that everything appeared to be normal during takeoff and that he retracted the landing gear as the airspeed approached 80 mph and retracted the flaps shortly after (witnesses also reported that the takeoff was normal and observed the landing gear retract). He stated that the engine experienced a total loss of power when the airplane reached 300 to 400 ft above ground level (agl). One witness reported hearing the engine "cut out" and then "surge." The witness also stated that the airplane began a right turn about 300 ft agl and appeared to stop climbing at this point while the turn appeared to become steeper. The pilot reported verifying that the fuel was selected to the appropriate tank, that the electric boost pump was on, and the mixture was full rich. He also stated that he tried to "pump the throttle" to regain power but was not successful. The pilot stated that he knew he would not be able to safely return to the airport and veered the airplane to the right to avoid any property or people who might have been straight ahead, aiming for the grassy area just to north side of the runway. The airplane rapidly lost altitude, leveled off, and bounced down on the grassy area where it came to rest.

One of the witnesses immediately drove a vehicle to the accident site and assisted the pilot in egressing from the airplane. The witness noted that the fuel selector was selected to the left tank, and the key was in the BOTH position. The electric boost pump was on, and the mixture was in the full rich position. To prevent a fire, the witness placed the fuel selector to the OFF position, turned the magnetos off, and selected the fuel boost pump to off. The witness also reported that he observed that the pilot had

sustained a laceration on his forehead and appeared to be confused but was able to walk away from the accident site. The pilot was then transported to the hospital for medical treatment.

AIRPLANE INFORMATION

The mechanic who performed the annual inspection stated that he had completed several static power engine runups the day before the accident; the engine produced power during each runup, and he did not note any abnormalities. He stated that the pilot had previously complained about a "cranking" issue during engine start, but the mechanic verified that this issue was not present during any of the engine starts that he conducted. The mechanic also stated that the airplane had been at PTW for about 2 weeks before the accident flight and was subject to several heavy rain events during that period. He also stated that the airplane had not been fueled since arriving at PTW.

The fuel tank capacity of the airplane was 24 gallons per wing tank (48 gallons total). Unlike later models, the 1962 and 1963 Mooney M20C does not have a pull ring to drain the fuel selector sump from the cabin. Instead, the selector sump is drained from the outside using the same procedure recommended for draining the wing tanks. The 1962 and 1963 models also have a gascolator (fuel strainer) in the nosewheel well, which can be inspected and drained from outside the airplane.

The wing tanks on the accident airplane were located in the front part of each wing root. Each tank had a sump drain under the wing from which fuel could be sampled to check for water or sediment contamination using a fuel sampler (a small plastic cup with an actuator prong). If water is present in the fuel, a distinct line separating the water from the gasoline may be seen through the plastic cup (being heavier than fuel, water would be on the bottom of the cup and fuel would be on the top).

Review of the Mooney M20C Owner’s Manual indicated that the fuel sumps should be drained as part of the preflight inspection.

WRECKAGE AND IMPACT INFORMATION

The airplane came to rest upright on an easterly heading with the landing gear retracted and the aft fuselage bent to the right. A 600-ft debris path started from a point near the right side of runway 28, near the west midfield taxiway intersection, and continued to where the airplane came to rest. About 150 ft from where the airplane first made ground contact, the left aileron, left elevator counterweight, and small wingtip parts were found in ground scars along the debris path.

Examination of the ground scars indicated that the airplane initially touched down on a north-northwest heading in a wings-level attitude then the right wingtip dug into the ground about 100 ft beyond this point. The airplane then slid another 100 ft and came to rest. All the flight control surfaces were accounted for at the accident site and no preimpact failures or anomalies of the flight control system were found. The fuel selector valve, electric fuel pump, throttle, and mixture controls were verified to be functional.

The engine remained secured to its mount on the firewall. Both propeller blades were bent aft 30º to 60º midspan and displayed no leading edge damage. Examination of the engine did not reveal any evidence of preimpact failure or malfunction that would preclude normal operation. The exhaust pipes displayed minor impact damage and the muffler and exhaust pipes contained no obstructions in the exhaust path.

Drive and valve train continuity was confirmed, and thumb compression was verified on all four cylinders. The cylinders were examined internally using a borescope and were unremarkable.

The magnetos were found secured on their mount at the rear of the engine on the accessory housing. The magneto-to-engine timing was checked, and both were found to be in compliance with the engine data tag specification of 25° before top dead center. All harness leads produced spark when the engine crankshaft was rotated. All eight sparkplugs were undamaged, and their electrodes displayed normal operating signatures. The oil suction screen was removed and found to be unobstructed; the engine contained oil.

About 10 gallons of fuel were recovered from each wing tank. Fuel samples taken from the left wing, fuel strainer, and right wing all contained water. Examination of the carburetor revealed that it was secured to its mount on the engine oil sump, and the airbox remained secured to the bottom of the carburetor. The carburetor heat flapper valve was in the OFF position. The carburetor float bowl was also found to contain water. Examination of the fuel tank cap seals and sealing surfaces revealed no evidence of cuts, abrasions, or deterioration.

Review of fueling records from the last known refueling indicated that the pilot had purchased 5 gallons of fuel on February 7, 2016, at Wings Field Airport, Philadelphia, Pennsylvania. Review of the fuel provider's records did not reveal any evidence of contamination.

Pilot Information

Certificate:	Private	**Age:**	42,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 Without waivers/limitations	**Last FAA Medical Exam:**	June 22, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	July 11, 2015
Flight Time:	334 hours (Total, all aircraft), 154 hours (Total, this make and model), 285 hours (Pilot In Command, all aircraft), 9 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	N242TS
Model/Series:	M20 C	**Aircraft Category:**	Airplane
Year of Manufacture:	1962	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	2010
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	March 8, 2016 Annual	**Certified Max Gross Wt.:**	2575 lbs
Time Since Last Inspection:	0 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4864 Hrs at time of accident	**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	O-360-A1D
Registered Owner:	On file	**Rated Power:**	180 Horsepower
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:	PTW,308 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	12:54 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / 15 knots	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.09 inches Hg	**Temperature/Dew Point:**	25°C / 5°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Pottstown, PA (PTW)	**Type of Flight Plan Filed:**	None
Destination:	PHILADELPHIA, PA (LOM)	**Type of Clearance:**	None
Departure Time:	13:09 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	HERITAGE FIELD PTW	**Runway Surface Type:**	Asphalt
Airport Elevation:	308 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	28	**IFR Approach:**	None
Runway Length/Width:	3371 ft / 75 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	40.239444,-75.556663(est)

Administrative Information

Investigator In Charge (IIC):	Gunther, Todd
Additional Participating Persons:	Thomas A Gilbert; FAA/FSDO; Allentown, PA Judson Rupert; Lycoming Aircraft Engines; Williamsport, PA
Original Publish Date:	May 5, 2021
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=92824