



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety

Western Pacific Region

November 19, 2019

AIRPLANE AND ENGINE EXAMINATION

WPR19LA243

This document contains 7 embedded photos.

(11 Pages)

A. ACCIDENT

Location: Reno, Nevada

Date: August 26, 2019

Aircraft: Mooney M20C

NTSB IIC: Stephen Stein

B. EXAMINATION PARTICIPANTS

Stephen Stein
Air Safety Investigator (IIC)
National Transportation Safety Board
Federal Way, Washington

Lee Oscar
Aviation Safety Inspector
Federal Aviation Administration
Reno, Nevada

Troy Helgeson
Air Safety Investigator
Lycoming Engines
Williamsport, Pennsylvania

C. DETAILS OF THE INVESTIGATION

HISTORY OF FLIGHT

On August 26, 2019, about 1644 Pacific daylight time, a Mooney M20C airplane, N78988, was substantially damaged during a forced landing attempt at Reno/Stead Airport (RTS), Reno, Nevada. Both passengers were seriously injured and the pilot did not receive any injuries. The airplane was registered to and operated by the pilot as a personal flight, conducted under the provision of Title 14 *Code of Federal Regulations* Part 91. Visual meteorological conditions prevailed and a flight plan was not filed for the cross-country flight, which departed Black Rock City Airport (88NV), Gerlach, Nevada about 1600.

According to the pilot, he departed 88NV for RTS to collect a friend who was attending an event in the Black Rock Desert. Prior to his departure, the pilot sumped the fuel tanks, added oil and subsequently departed on the accident flight with the fuel tanks about half full. The soft field takeoff from 88NV, climbout, and cruise segments of the accident flight were uneventful. The pilot departed with the right fuel tank selected and then immediately switched to his left fuel tank after he reached about 8,500 ft mean sea level. He then configured the airplane for cruise flight by reducing his throttle setting and leaning the mixture. As he approached RTS, he descended below the airport's traffic pattern altitude, engaged the fuel pump and switched to the right fuel tank just before he entered the right base leg of the airport traffic pattern for runway 26. The pilot

stated that he verified positive fuel pressure while he switched the fuel tanks. Immediately after the pilot disengaged the fuel pump and while he was turning onto the final approach leg of the airport traffic pattern, the engine sputtered and then quit. The pilot made one unsuccessful attempt to restart the engine after he switched the fuel selector back to the left tank and engaged the fuel pump. He then pitched the airplane for the published best glide speed, 100 mph, and configured the airplane for a forced landing. The pilot stated that he was focused on the airspeed indicator during the landing attempt and was not looking outside the airplane when the airplane impacted a fence and then the ground.

The wreckage was retained for further examination.

PERSONNEL INFORMATION

The pilot, age 33, held a private pilot certificate with a rating for single-engine land, which was issued on August 6, 2019. His most recent third-class medical certificate was issued on October 1, 2018, which did not include any medical restrictions. According to the pilot's statement, at the time of the accident he had amassed 127 total flight hours in all aircraft and 91 flight hours in the airplane make and model. He accumulated 54 flight hours in the airplane make and model in the 90 days that preceded the accident.

AIRCRAFT INFORMATION

Federal Aviation Administration records showed that the airplane was manufactured in 1962 and was registered to the owner/accident pilot on February 22, 2019. The airplane was powered by a Lycoming Engines O-360-A1D, air cooled, 180 horsepower, reciprocating engine. Maintenance records showed that the airplane's most recent annual inspection was completed on February 20, 2019 at a total time of 3,916 flight hours. The engine had accrued 4,014 total flight hours and 119 hours since the engine's most recent overhaul, which was accomplished on April 25, 2016. At the time of the accident, the engine had accumulated 98 flight hours since its annual inspection.

The pilot reported that he departed 88NV with 21.6 gallons of fuel onboard; about 10.3 gallons in each wing.

ADDITIONAL INFORMATION

An examination of the airplane and engine was performed on November 19, 2019 by a representative of Lycoming Engines, two Federal Aviation Administration inspectors, and the NTSB Investigator-in-Charge.

Airplane Examination

The airplane was in an upright position and structurally intact. The nose landing gear had separated and both main landing gear were in the retracted position. Examination of the right wing showed aft crush damage to the leading edge from the wing root to about midspan and additional damage to the right wingtip. The left wing leading edge displayed some deformation

about midspan and outboard. Both the lower cowling and belly skin exhibited vertical crush deformation. Additionally, the right door had been penetrated by a fence post and barbed wire (photograph 1).

Both propeller blades remained attached to the engine at the propeller hub. One blade exhibited blade tip curling and several gouges. The other blade displayed a slight bend.

The fuel system was comprised of two integral fuel tanks, sealed in the forward wing root of each wing. The total fuel quantity for each wing was 24 gallons according to the fuel selector valve; however, the pilot's operating handbook reported the fuel capacity as 26 gallons. Aluminum fuel lines direct fuel from each wing tank to the fuel selector valve, which is downstream of the electric boost pump and gascolator. Fuel senders in each wing are equipped with floats that rotate up and down on an axis and report the fuel level to the fuel gauges in the cockpit.

Fuel line continuity was confirmed from the right and left fuel tanks to the engine through the fuel selector, electric boost pump, and gascolator, and no breaches in the fuel lines were noted. The right wing fuel tank was breached and the left wing was presumed to have been intact based on initial reports. Approximately 3 gallons of 100 low lead aviation grade gasoline were placed in the left wing and the fuel was almost immediately expelled at the center belly and wing root due to an undiscovered rupture in the forward left fuel tank. The fuel selector rotated normally to the right tank, left tank and OFF position detents. Air was blown through the unit and no obstructions were observed. The gascolator fuel bowl contained several ounces of gasoline that did not appear to have been contaminated by debris or water (photograph 2). Additionally, the gascolator screen was free of debris.

Both fuel tank gauges indicated erroneous fuel quantity indications with and without power applied to the airplane. The resting position of the left tank fuel sender was about 0.5 inches above the bottom of the tank and the resting position of the right tank sender was about 4 inches above the bottom of its respective fuel tank (photographs 3 and 4). The fuel gauges were tested manually with and without power applied to the airplane by manually placing each fuel sending unit in its low and high positions. The results of these tests are captured in the table below.

Fuel Tank	Without Power	Sender at Low Point – With Power	Sender at High Point – With Power
Right Tank	Below Empty	At Empty	108 lbs
Left Tank	6 lbs	36 lbs	140 lbs

Examination of the fuel sending units revealed that separate models had been installed in the right and left fuel tanks (photographs 5 and 6). The fuel sending units and fuel gauges have been retained for further examination.

Engine Examination

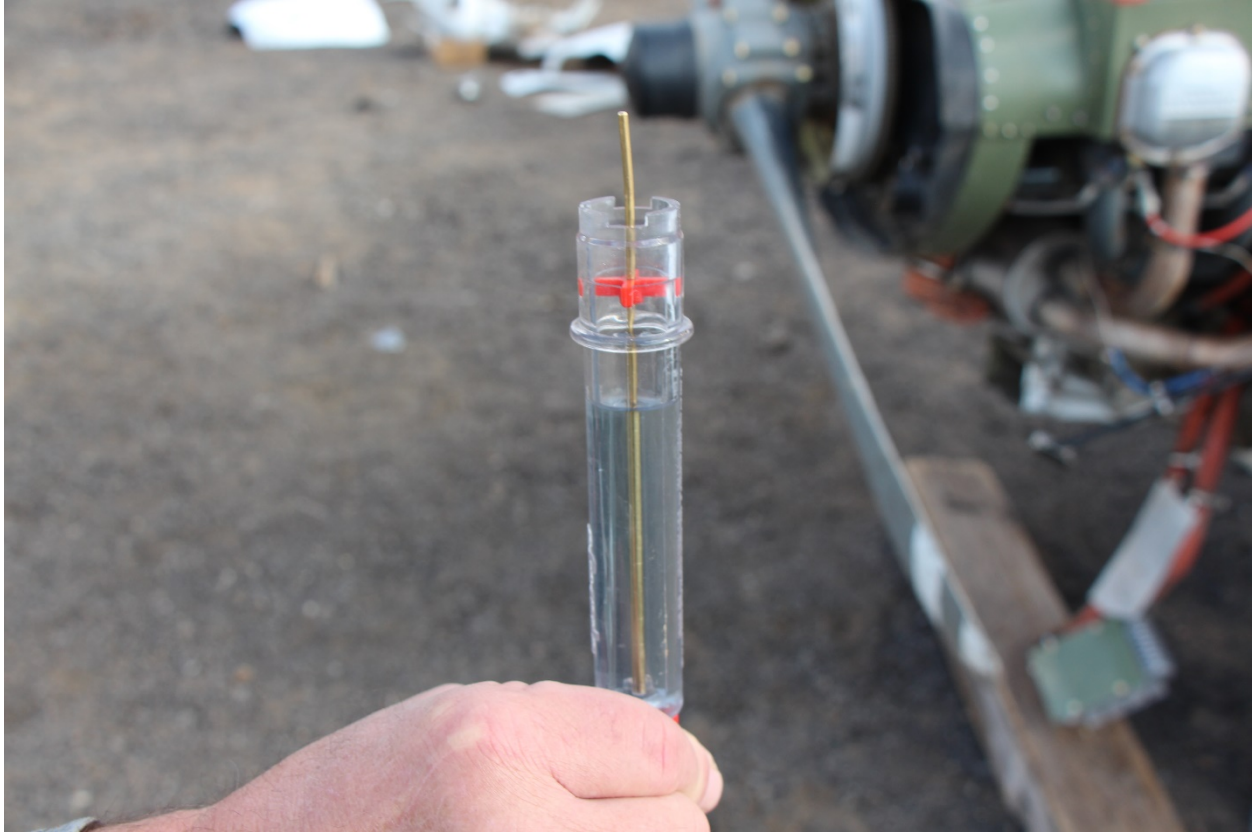
The engine was mostly intact with the exception of the airbox and exhaust, which exhibited minor damage (photograph 7). The engine contained approximately 6 quarts of oil. It was noted

that the hobbs connection at the oil pressure switch was separated and the oil filter had not been properly safety wired.

Approximately one gallon of aviation gasoline was plumbed directly into the engine driven fuel pump. The engine was started using a checklist found inside the cockpit and ran successfully on the second start attempt. After idling for a minute at 1,000 rpm, the engine power was advanced to 1,700 rpm for an engine run-up. The left and right magnetos exhibited a drop of 100 rpm individually and a negligible difference between both magnetos. The throttle was subsequently advanced to the full open position and 2,700 rpm. Oil pressure was normal at startup and advanced to above redline after the engine power was advanced to the full throttle position. It was noted that the engine ran smooth and continuous during the engine run.



Photograph 1: Right Quartering View of Accident Airplane Showing Fence Post and Barbed Wire at Door



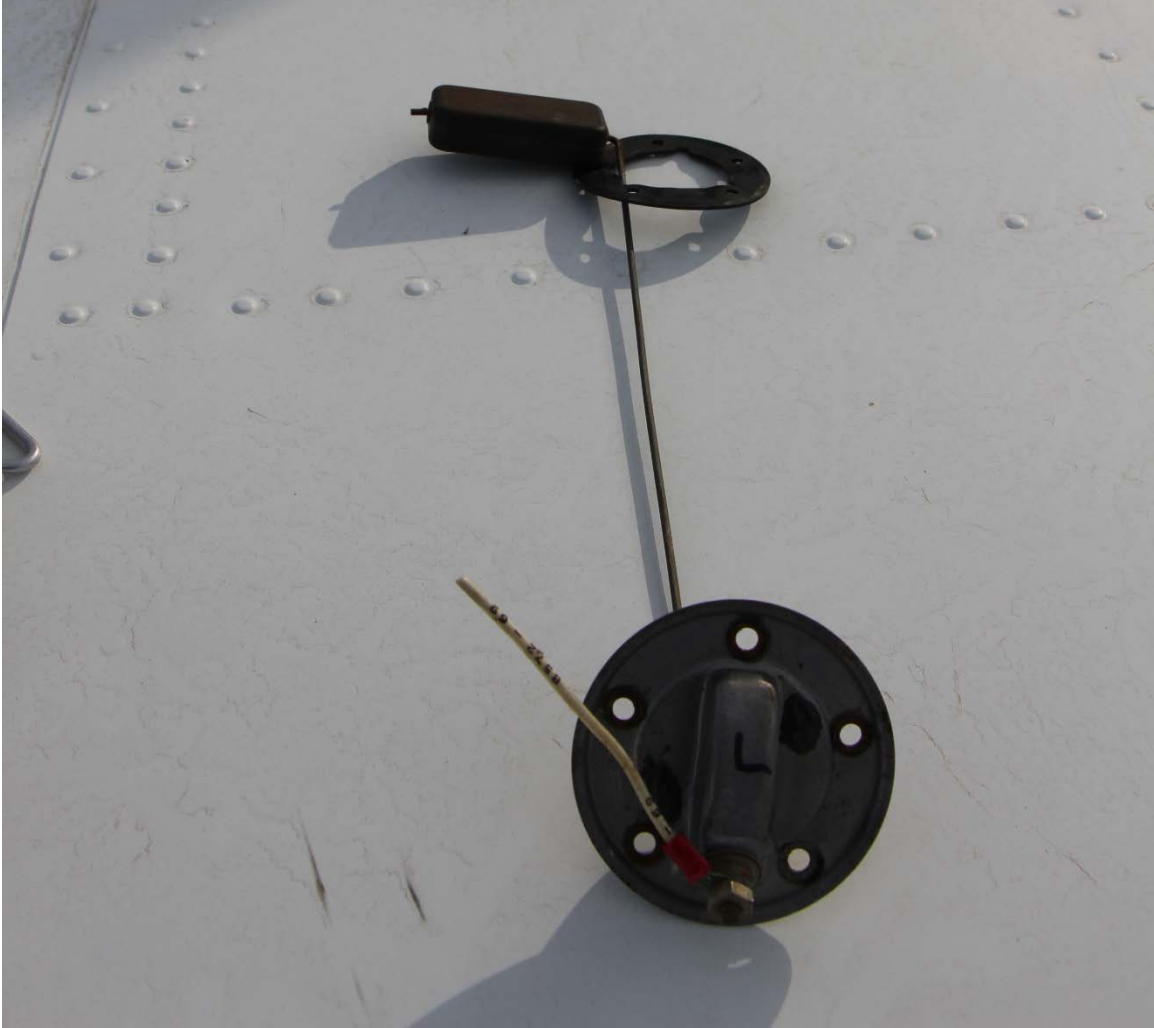
Photograph 2: Fuel Drained from Gascolator



Photograph 3: Left Fuel Tank Sending Unit at Low Point In Fuel Tank



Photograph 4: Right Fuel Tank Sending Unit at Low Point In Fuel Tank



Photograph 5: Left Fuel Tank Sender



Photograph 6: Right Fuel Tank Sender



Photograph 7: Uncowled Engine