NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety-Eastern Region
Ashburn, Virginia 20147
July 16, 2018

ENGINE-DRIVEN FUEL PUMP EXAMINATION FIELD NOTES

A. ACCIDENT:

Location: West Milford, NJ
Date: May 2, 2018
Time: 1410 EDT
Aircraft: N4153R, Piper PA-32-300

B. COMPONENT GROUP:

Chairman: Timothy W. Monville
National Transportation Safety Board (NTSB)
Senior Air Safety Investigator, Office of Aviation Safety
Ashburn, Virginia

SUMMARY

On May 2, 2018, during daylight hours, a Piper PA-32-300, N4153R, was destroyed when it impacted terrain at the Greenwood Lake Airport (4N1), West Milford, New Jersey. The private pilot was fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the personal flight to Orange County Airport (MGJ), Montgomery, New York. The airplane was registered to IHAF Flying Mission LLC and operated by the private pilot. The personal flight was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91.

A flight instructor located at 4N1, who was also a friend of the pilot stated that he talked with the pilot just before the accident. He stated that the pilot told him that he was having problems with the airplane's engine, and thought it was either the magnetos or the spark plugs. The pilot stated he was going to taxi to the end of the runway and perform an engine run-up. If the engine run-up was successful, he was going to take a short flight to MGJ and then return.

A witness, located 1 mile north of the airport, heard the airplane takeoff and then heard the airplane's engine sputter, then shut off. He then heard the sound of a crash and called 911.

The wreckage was consumed by a postcrash fire and located in a wooded area, about 1,100 ft to the left side of the departure end of runway 24. Tree branches were observed broken descending about a 12° angle and extending approximately 50 ft on a magnetic heading of 110° to the main wreckage. The main wreckage came to rest upright. The instrument panel was consumed by fire and no readable instruments were recovered. Both wings separated from the fuselage and were located about 30 ft behind the fuselage. The wings exhibited minor fire damage. 100LL aviation fuel was found in both wing tanks. All major components of the airplane were accounted for at the scene. Control cable continuity was confirmed through breaks, that were consistent with overload separations, to the respective controls.

The engine remained attached to the airframe, and the propeller blades were both bent aft at mid-blade. Thumb compression was established on all cylinders and a lighted boroscope was used to examine all pistons and valves with no anomalies noted.

The six seat, low-wing, tricycle gear airplane, serial number 32-40468, was manufactured in 1968. It was powered by a Lycoming IO-540-K1A5, 300-horsepower engine, equipped with a two-bladed Hartzell propeller.

The engine-driven fuel pump, and servo fuel injector were retained for further examination.

C. DETAILS OF THE INVESTIGATION

The Crane/Lear Romec engine-driven fuel pump was shipped to NTSB investigator Tim Monville via UPS next day air airbill 1ZA41W550194672078, and was delivered on May 17, 2018. The pump was secured in a brown colored bag and sealed with Evidence Tape. The pump was hand carried to CJ Aviation located in Miami, Florida, on May 23, 2018, for operational testing and examination.

Initial examination of the pump revealed a data plate with markings for part number RG17980D/M, and serial number S/N B8591. A portion of flexible hose remained attached by steel clamp to the drain fitting, but the flexible hose was cut about 1.75 inches from the fitting. A deck pressure fitting was installed (provided for pressurized aircraft), but the fitting was fractured[1]. A flexible hose was attached to the outlet fitting and was marked on the exterior with "Parker Tough Cover 451TC-6W" with a portion of the "W" obscured by the ferrule/sleeve. The hose was tightly secured at the fitting at the pump outlet port, and the ferrule/sleeve of the hose was marked with "P43-6-R1-R2-R3" and "10643-6-6", while the fitting at the opposite end of the hose was not straight. The ferrule/sleeve at the open end of the hose was also marked with "10643-6-6", and P43-6-R1-R2-R3."[2] The fitting at the inlet port of the pump was a straight fitting, while the fitting at the outlet port of the pump was a 45° elbow type.

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[1] According to CJ Aviation, based on the engine application, the deck pressure port should have been plugged and a fitting should not have been installed.

[2] According to www.parker.com, P/N 10643-6-6 is a crimp style hydraulic female JIC 37° swivel steel fitting with a straight shape for a -6 size hose.

By physical inspection, the valve housing was correct per the modification to the valve body marked with "LR47102 Rev B."

A quality aircraft accessories tag was affixed to the valve body.

Examination of the pump drive shaft revealed no damage to the shaft or teeth.

The pump was placed as received on a test bench with motor voltage calibrated for 2,575 rpm and the fluid coming out of the pump was directed into a clean white plastic bucket. A few black specs of material were noted discharged from the pump. The outlet hose was then connected to the test bench (normal to return fluid to the holding tank) and normal self-priming occurred. At 11.0 volts, 2,575 rpm, the unit flowed 72.8 gallons-per-hour (gph) at 5.1 psi, or 436.8 pounds-per-hour (PPH). At 11.6 volts, 2,575 rpm, and 22 psid, the unit flowed 60.8 gph, or 364.8 PPH[3]. At 5.0 volts, 600 rpm, and 16 psid, the unit flowed 7.0 gph, or 42 PPH[4].

During testing, no leaks were noted on the exterior of the pump or from the drain line, but slight leakage was noted from the end of the outlet hose fitting that would connect to the fuel injection servo. The pump was retained by NTSB.

The pump was brought back to CJ Aviation on July 3, 2018, for testing at 2,650 rpm. The pump was installed/connected onto a 3-phase motor with attached coupling that mated with the engine-driven fuel pump; the motor rpm was calibrated and presented on a digital gauge along with motor load or torque. For testing, the pump discharge was directed into a plastic container that had been previously calibrated in gallon increments, and was timed using a calibrated stopwatch. The pump was operated at 2,650 rpm, and 22 psid, and flowed 1 gallon in 45.31 seconds, which calculated to be 79.45 gph, or 476.7 PPH. The pump was then operated at 600 rpm and 16 psid, and flowed 0.25 gallon in 1 minute 01.25 seconds, which calculated to be 14.69 gph, or 88.15 PPH. The pump was removed from the motor and the hose attached to the outlet fitting was removed for examination. A circumferential gouge was noted on the flare of the outlet fitting (Figure 5), which was marked with "MS." The outlet fitting of the pump was examined with a video comparator and the flare angle was determined to be about 41°. The inlet fitting of the pump was examined and marked with "AN." It was also examined with the video comparator and the flare was about 39.1°.

PARTS DISTRIBUTION

The engine-driven fuel pump was retained by NTSB pending further testing with it and the fuel injection servo.

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[3] Specification calls for testing at 2,650 rpm, 20 inches of Mercury inlet pressure, and 22 psid minimum discharge pressure. The minimum required flow is 360 PPH, or 60 GPH.

[4] Specification calls for testing at 600 rpm, 20 inches of Mercury inlet pressure, and 16 psid minimum discharge pressure. The minimum required flow is 10 PPH, or 1.6 GPH.

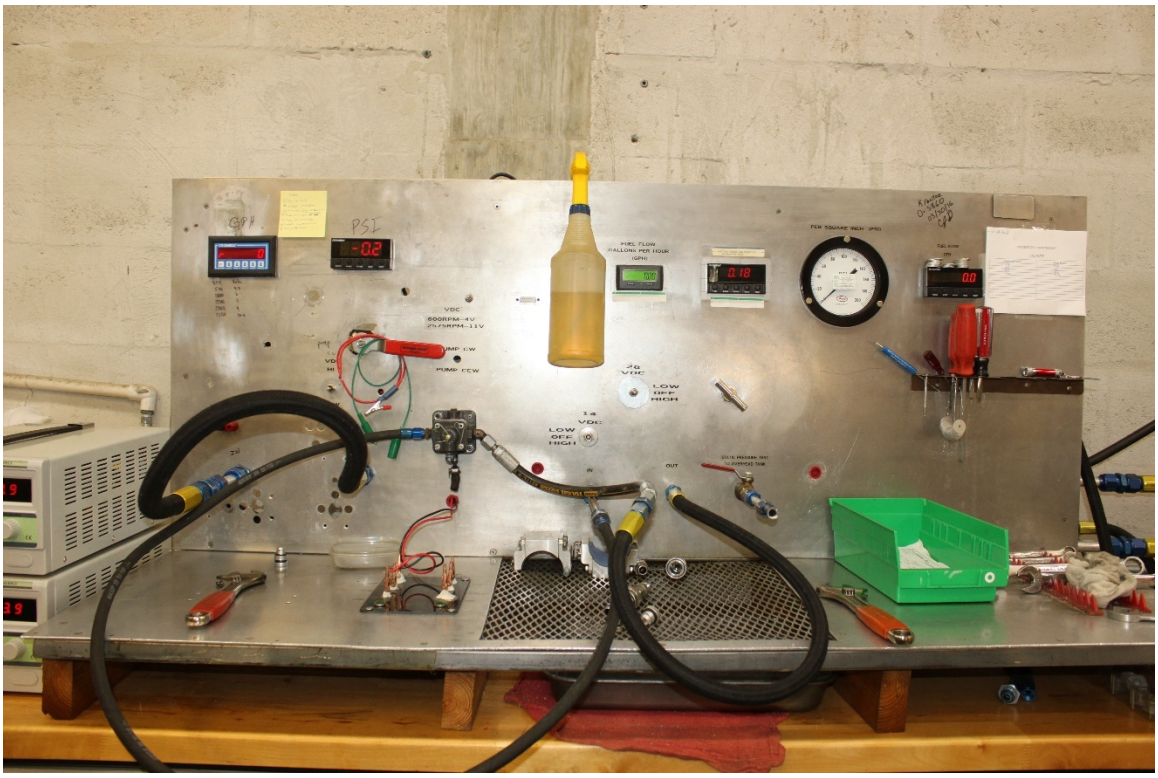

Figure 1: Engine-Driven Fuel pump on Test Bench with Outlet Hose Attached

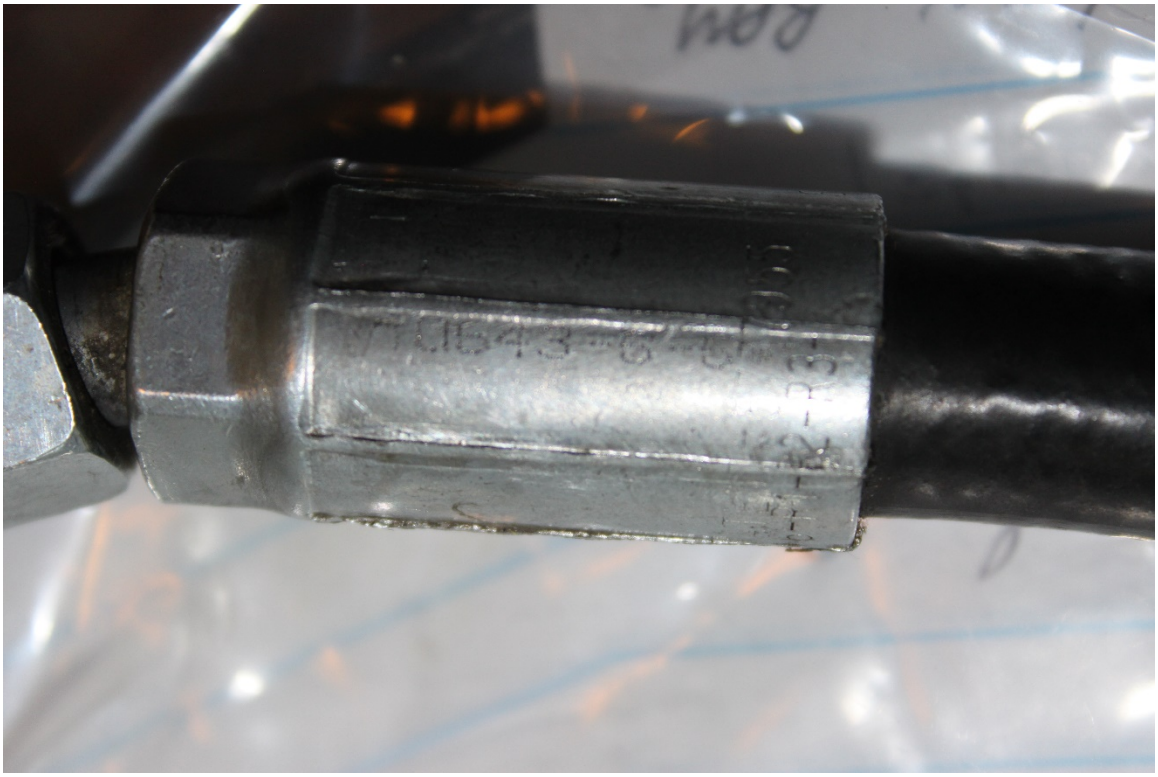
Figure 2: View of the Ferrule/Sleeve at the Outlet Hose End that Would Connect with the Fuel Injection Servo. Note the marking 10643-6-6.

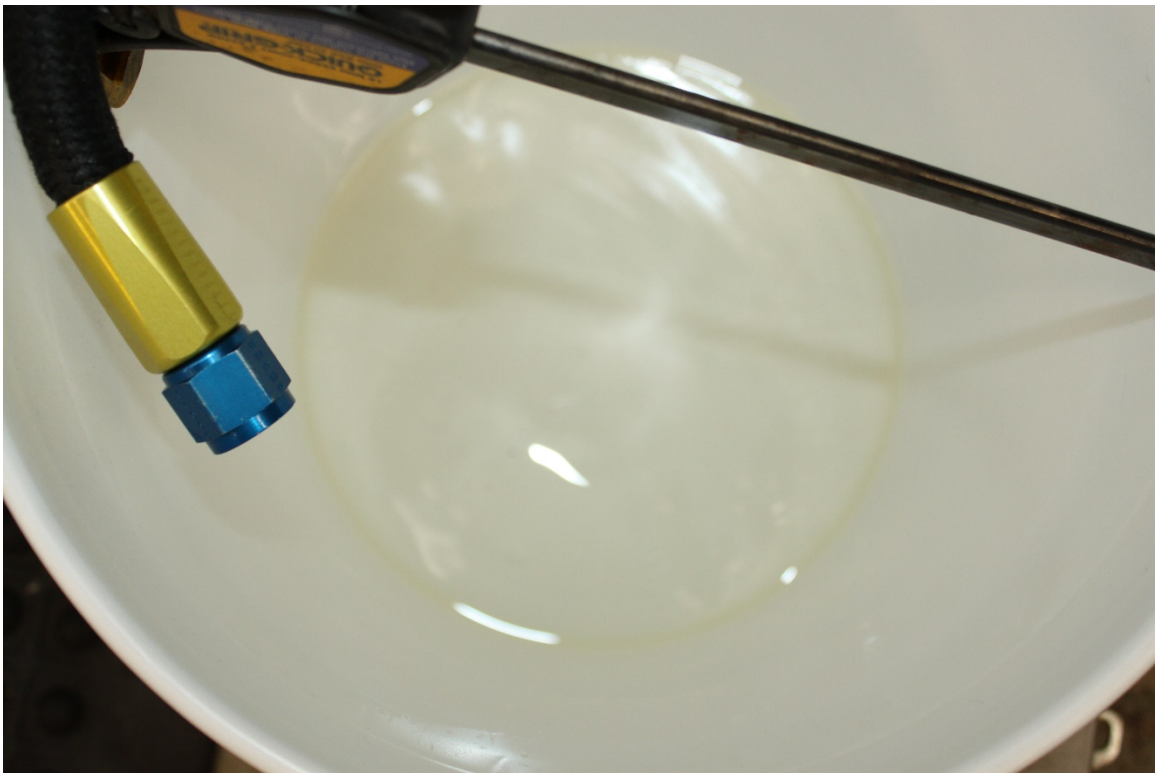

Figure 3: View of the Clean White Bucket Used to Capture the Fluid First Exiting the Pump.

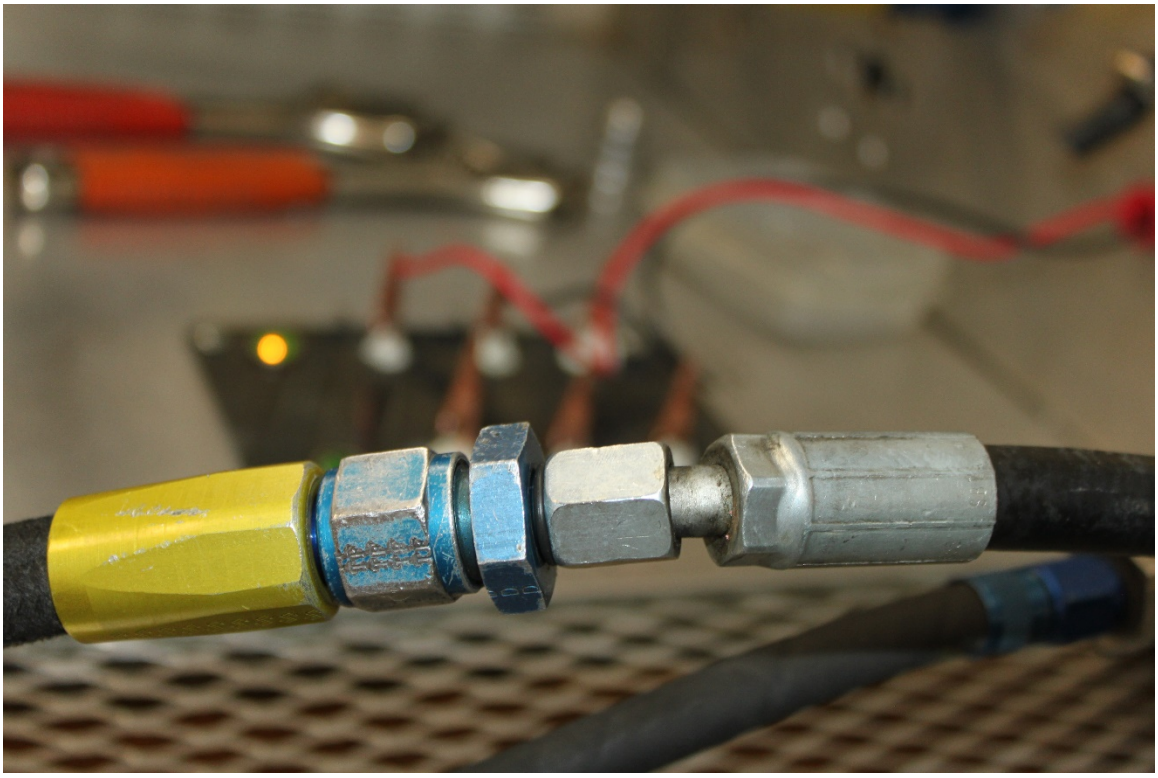

Figure 4: View of the Outlet Hose and the End That Would Connect to the Fuel Injection Servo. Slight Seepage was noted at the Area of the Sleeve/Ferrule.

Figure 5: View of the Outlet Fitting. Note the circumferential gouge in the flare.