

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR22LA296

FUEL PUMP EXAMINATION

April 24, 2023

A. ACCIDENT

Location: Corona, California
Date: August 9, 2022
Airplane: Piper PA-32-300, N841AD

B. FUEL PUMP EXAMINATION

Investigator Elliott Simpson
NTSB

Specialist John Jackson
Pacific Continental Engines

C. DETAILS OF THE EXAMINATION

1.0 Summary

The fuel pump was examined at the facilities of Pacific Continental Engines on April 24, 2023. The pump exhibited evidence of a preexisting fuel leak at the case split, along with corrosion to the input drive seal area. According to the Pacific Continental representative, leaking at the case split is not an uncommon occurrence, and an Airworthiness Directive exists that requires the tightening of the case screws at 100-hour intervals. Irrespective, the pump was able to both maintain and exceed output fuel pressure at idle and high speeds. The pump performed within limits when the kinked output fuel line was installed, however, as the line was progressively twisted the pump pressure reduced until it was no longer able to maintain adequate output pressure.

2.0 Examination

Engine Driven Fuel Pump
Part Number: RG17980
Serial Number: C-2389

The pump was intact, and its inlet fuel line remained attached by its fitting (figure 1). The outlet line was in place but was loose at its fitting. The fire sleeve at the end of the line had been previously removed, and there was a kink in the braided line (figure 2).

The pump exhibited discoloration and stains consistent with a preexisting leak (figure 3). The input drive shaft seal plate was covered in brown and red colored deposits, consistent with corrosion (figure 4).

The fuel lines were then removed, and the unit was installed in a fuel injection flow bench and operated at various speeds and fuel flows (figure 5). During the tests, fuel wept from the split case seal (figure 6), and fuel drained continuously from both the input drive seal drain (figure 7), and the seal at the driveshaft. Red and brown corrosion-like deposits were observed in the leaking fluid (figure 8).

Test 1, Set Point Test:

Speed: 2,650 revolutions per minute (RPM)
Fuel Flow: 225 pounds per hour (PPH)

At these speeds and flow, the pump maintained an output pressure of 32.4 pounds per square inch (PSI). The nominal values should have been between 24-28 PSI.

Test 2, High Speed Test:

Speed: 2,650 RPM
Fuel Flow: 360 PPH

At this speed and flow, the pump maintained an output pressure of 30 PSI. The nominal value should have been 22 PSI or higher.

Test 3, Idle Test:

Speed: 600 RPM
Fuel Flow: 10 PPH

At this speed and flow, the pump maintained an output pressure of 25 PSI. The nominal values should have been 16 PSI or higher.

Test 4, Kinked Line Test:

To determine if the kinked outlet line could restrict fuel flow, the line was installed in the flow bench with the pump (figure 9). With the line kinked as-found, the pump output pressures were the same as for previous tests.

The line was then progressively bent by hand at the kink, and fuel pressure remained unchanged until it reached a bend angle of about 100°, when the pressure began to decrease.

A series of tests were then performed with the fuel outlet line tightened so that it increased the twist in the line (figure 10). It was found that under these conditions, the fuel pressure could be reduced considerably more than when bending by hand, such that at one point fuel pressure reached 5 PSI.

3.0 Examination Photos



Figure 1 - Fuel pump assembly



Figure 2 - Kinked outlet line



Figure 3 - Fuel pump discoloration



Figure 4 - Input drive seal plate



Figure 5 - Fuel Injection Flow Bench



Figure 6 - Fuel leak from split case seal

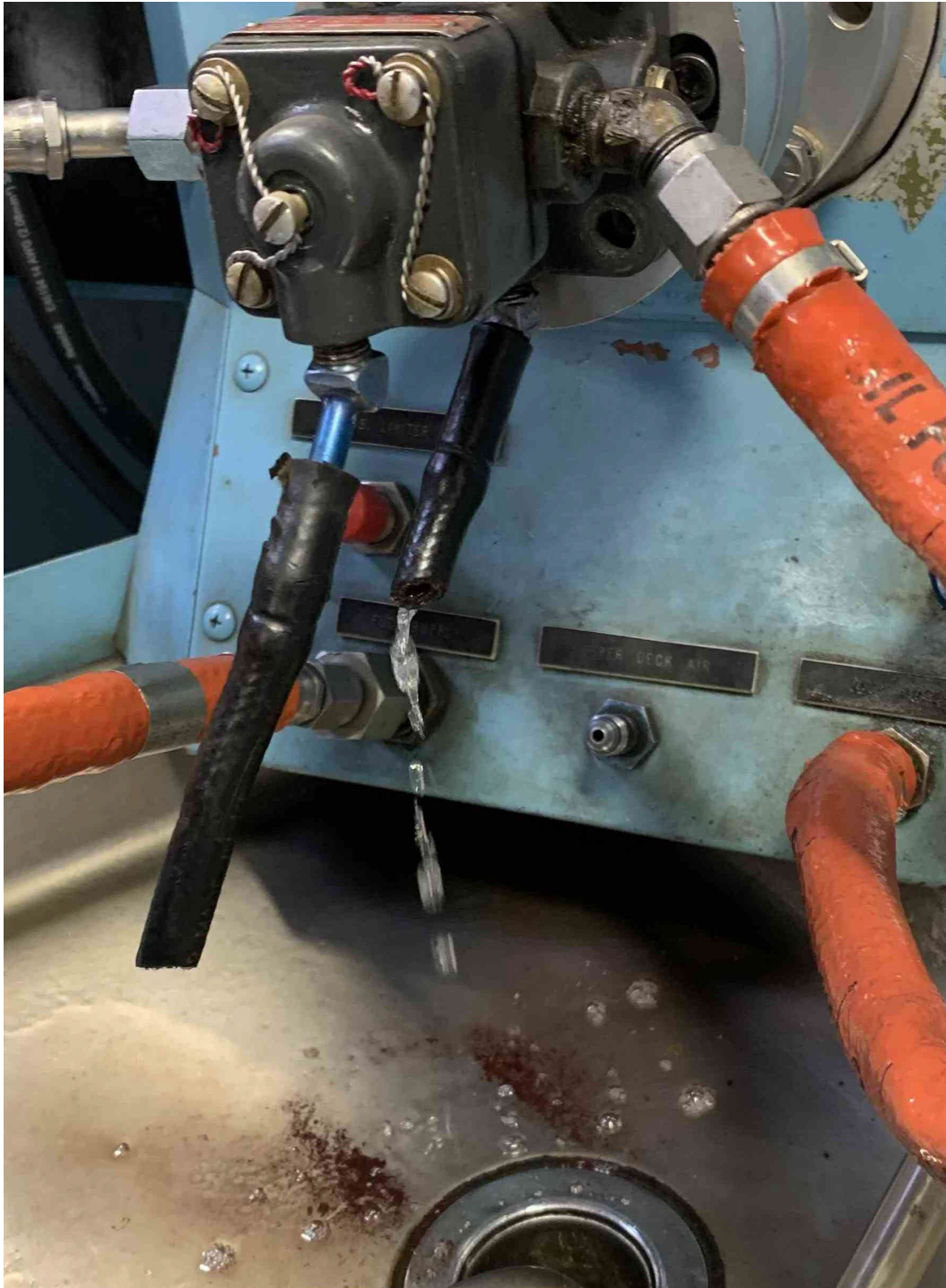


Figure 7 - Fuel leak from input drive seal drain



Figure 8 - Corrosion-like deposit from seal drain



Figure 9 - Kinked output line installed



Figure 10 - Output line twisted until flow limited

Submitted by:

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