

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA23FA313

PROPELLER GOVERNOR EXAMINATION

January 29, 2024

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A. ACCIDENT

Location: Churchville, MD
Date: July 25, 2023
Time: 1906 EDT
2306 UTC
Airplane: Piper PA-28R-200; N34PT

B. PROPELLER GOVERNOR EXAMINATION

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C. SUMMARY

On July 25, 2023, about 1906 eastern daylight time, a Piper PA-28R-200, N34PT, was substantially damaged when it was involved in an accident near Churchville, Maryland. The commercial pilot was fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

D. DETAILS OF THE EXAMINATION

1.0 Propeller Governor Examination

The F-2-7A governor is an intermediate capacity, pressure to increase pitch, non-feathering governor intended for use on a Lycoming IO-360 engine with a standard AND20010 drive pad. The governor responds to a change in engine/propeller RPM by directing oil under pressure to the propeller hydraulic cylinder, or by releasing oil from the hydraulic cylinder to the drain. The change in oil volume in the hydraulic cylinder changes the propeller blade angle and returns the engine/propeller system RPM to the pilot-selected RPM.

1.1 Condition As Received

The Lycoming drive adaptor, a portion the Piper control cable and cable support truss were still attached to the governor. The drive adaptor was damaged by impact forces and only rotated approximately 180° before binding. Once the control cable and drive adaptor were removed, the control arm and governor pump shaft/drive gear moved freely by hand force. The governor external and internal surfaces were wet with oil but there was no measurable amount of residual oil in the pump. The high rpm stop post on the control arm was bent and partially fractured. The governor head had some gouging/wear due to contact with surrounding components.



Photo 1: Overview of governor as received. (Hartzell Photo)



Photo 2: View of bent/fractured high RPM stop post. (Hartzell Photo)



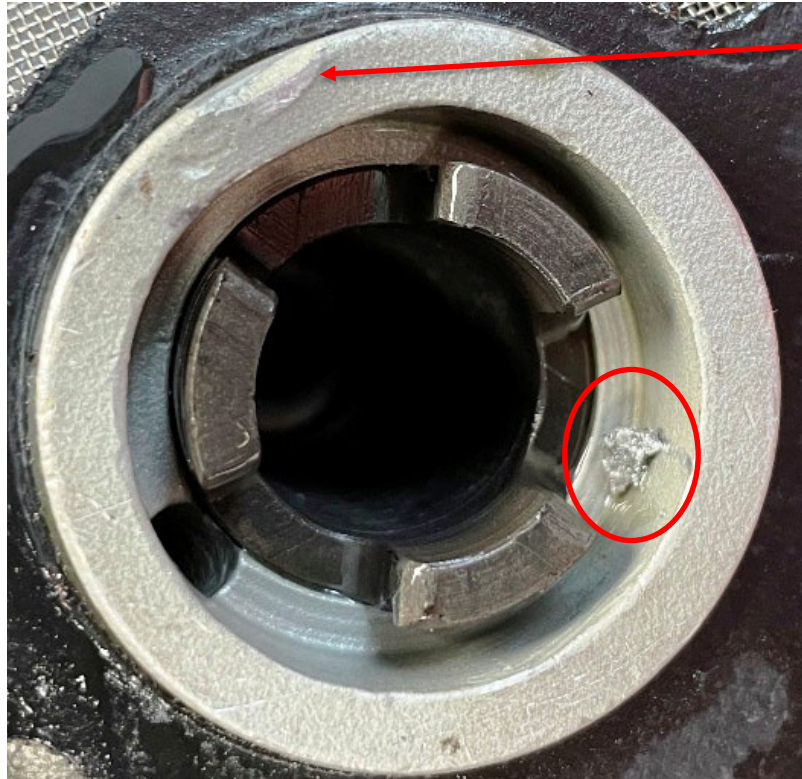
Photo 3: Gouging/wear on the governor head. (Hartzell Photo)

1.2 Preparation for Bench Test

The Piper control cable and Lycoming drive adaptor were removed. There was impact damage to the governor pilot flange; a dent/deformation as well as a visible crack in the base radius. The mounting flange/surface had some impact damage along one edge, but it did not prevent leak-free seating on the test stand using a new gasket. The removed gasket/screen did have a small amount of foreign debris near a corner on the inlet side of the screen. The debris appeared to be a hard, black/grey, polysulfide sealant. There was also some metallic debris in the drive bore that appeared to be from the Lycoming drive adaptor impact damage.



Photo 4: View of impact damage to the governor pilot flange. (Hartzell Photo)



Damage seen in
Photo 4

Photo 5: Metallic debris in the drive bore. (Hartzell Photo)



Photo 6: Base and gasket/screen as received. (Hartzell Photo)



Photo 7: Governor mounting flange impact damage on edge. (Hartzell Photo)

1.3 Governor Functional Test

The governor was mounted on the Hartzell governor test stand with a new gasket for a functional test as specified in Hartzell Manual 130B. The governor was not flushed prior to this test. There was no foreign debris detected in the oil coming from the governor during this test. The following tests were run with the noted performance.

1. Pressure relief setting was 266 psi vs. a requirement of 275-300 psi.
2. Pump capacity flow rate was approximately 7.7 quarts at 1755 RPM vs. a requirement of 8-12 quarts/min.
3. Leakage rate was 17-18 oz. vs. a maximum limit of 8 oz./min.
4. With the high RPM stop visually positioned the RPM was 2330 RPM at 115°F oil temperature vs. a requirement of 2330 +/- 10RPM.
5. There was no external leakage noted.



Photo 8: View of the governor installed on the test stand. (Hartzell Photo)

1.4 Teardown

The governor was disassembled to investigate the reasons for the lower relief pressure, flow rate and high leakage. The only abnormal wear was some rotational scoring between the drive gear and body and between the flyweight unit and body. Otherwise, there were no unusual visual discrepancies noted, nor any debris found on any internal components during the disassembly and inspection of the governor.

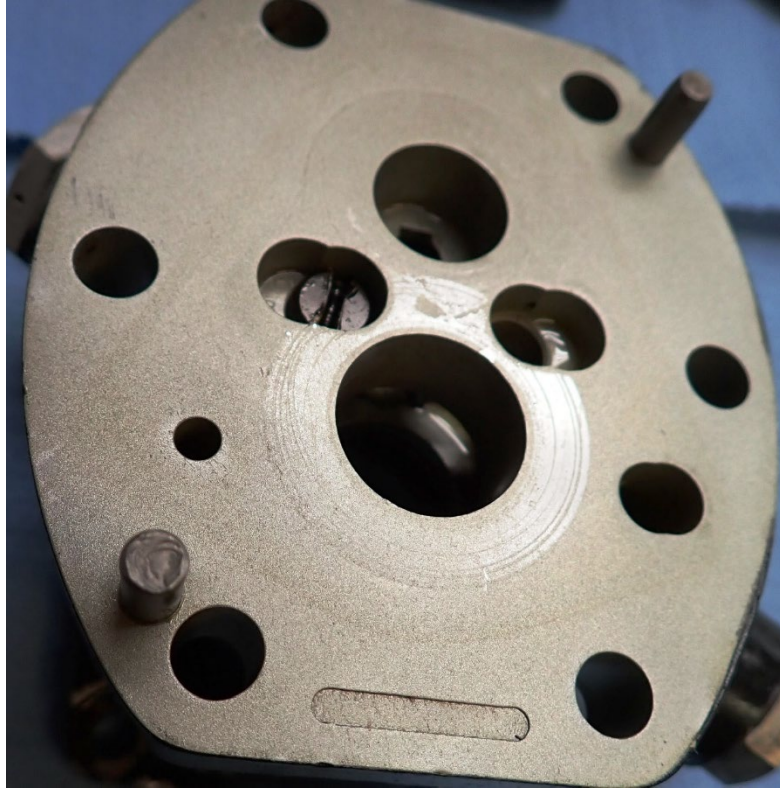


Photo 9: Rotational scoring on body from drive gear. (Hartzell Photo)

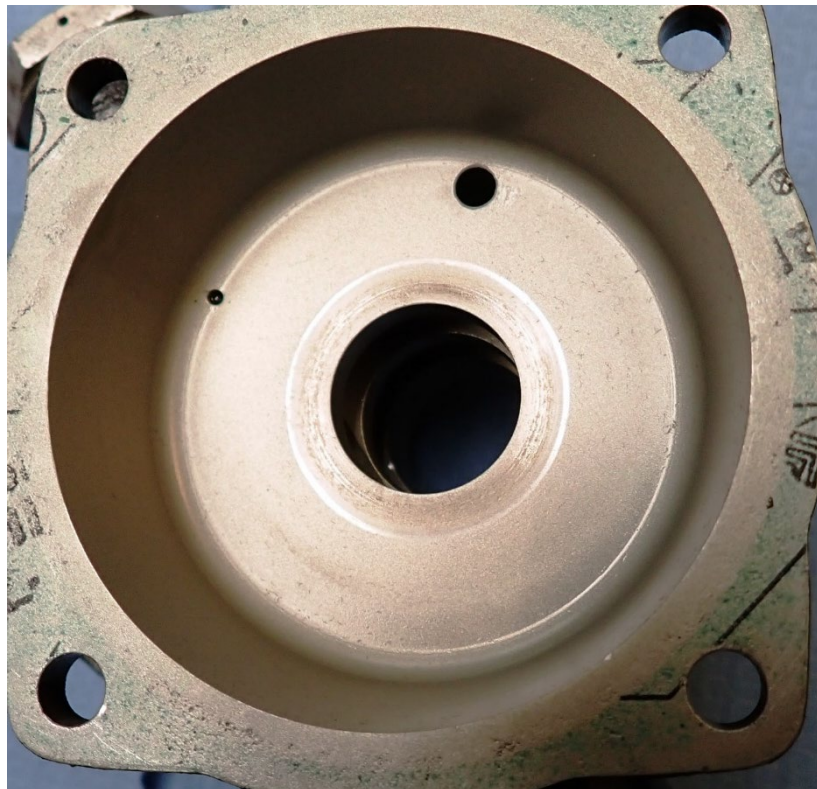


Photo 10: Rotational scoring on the body from flyweight unit. (Hartzell Photo)

The dimensional measurements are summarized below:

Control Shaft & Head - The control head had gouging on the external surface. The high RPM stop post was bent and partially fractured. The control shaft appeared to have some bend at the shaft end, but it did not affect function.

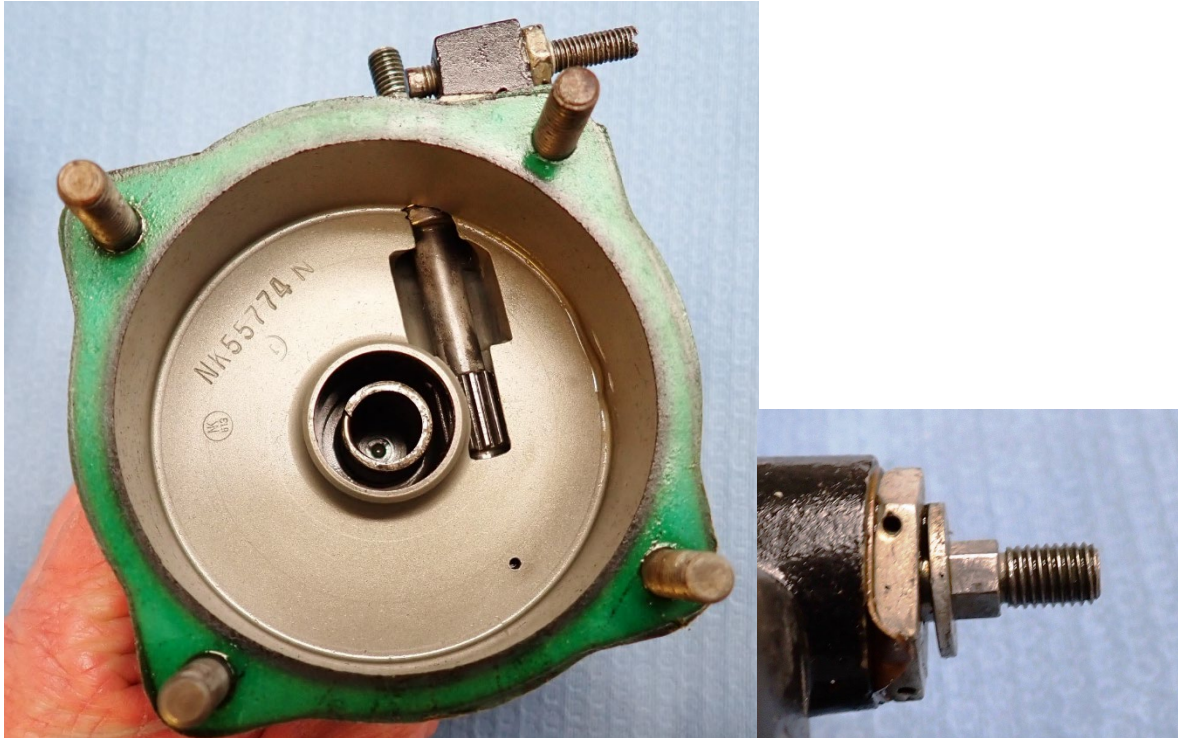


Photo 11: Control shaft and head. (Hartzell Photo)

Body - The drive gear shaft bore was oversized (0.8758 vs. 0.8756 maximum).

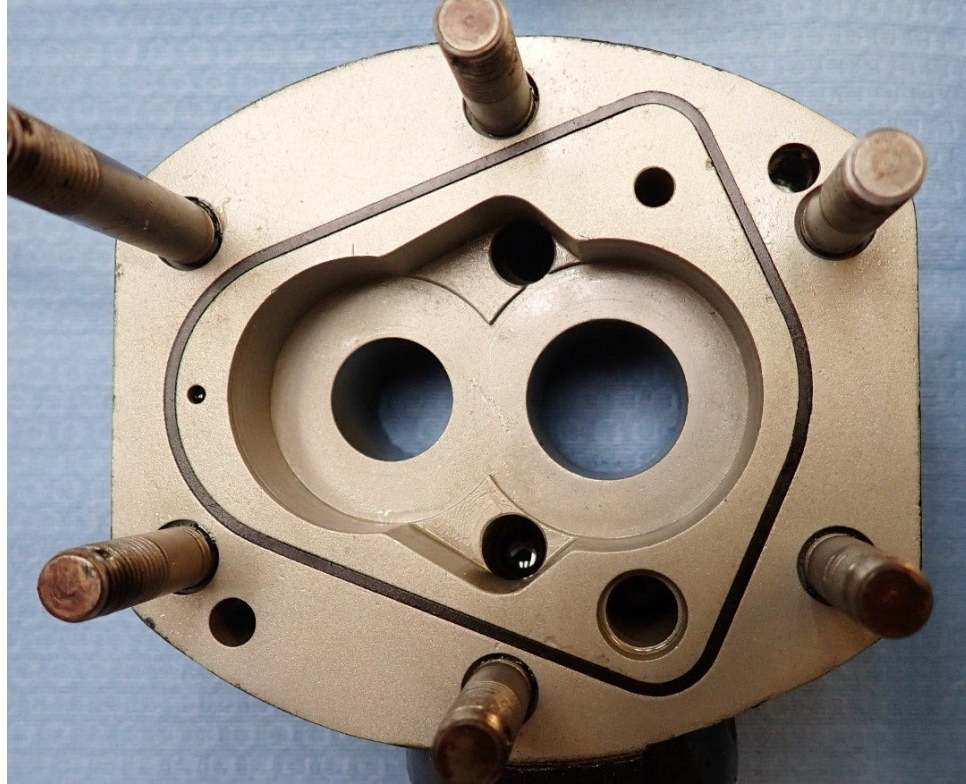


Photo 12: Governor oil pump body. (Hartzell Photo)

Spool and Relief Valve - The spool diameter was undersized (0.5610 vs. 0.5614 minimum) and the relief valve plunger was slightly undersized on one measurement (0.4981 vs. 0.4985).



Photo 13: Governor spool, speeder spring, and flyweight unit components. (Hartzell Photo)



Photo 14: Pressure relief valve components. (Hartzell Photo)

Flyweight Unit - Serviceable, no discrepancies noted.

Drive/Pump Gears - Serviceable, no discrepancies noted.



Photo 15: Governor oil pump gears. (Hartzell Photo)

Submitted by:

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