

Prepared by:
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Findings: During the post incident inspection conducted on 2/20/2019, under the oversight of the Federal Aviation Administration officials the following items were noted as deficient or not in accordance to acceptable standards for airworthiness. The inspection was limited to the following areas on the left and right engines; the removal and inspection of the spark plugs, compression check, borescope of the cylinders, and inspection of the fuel system. The discrepancies found are noted below.

Generally, aside from the propellers there was no apparent external damage to the engine case or accessories. There were consistent findings of improper hardware used to secure engine fuel injector lines between the dividers and cylinders. Fuel supply lines to the fuel servos on both engines appeared clean and had an appropriate blue tint. The amount of fuel retrieved from the fuel supply line and servo was not measured, but it is estimated that less than 5 ml of fuel was drained from each fuel servo supply line. Fuel drains in the left and right wing tanks were corroded and unable to be exercised. Upon removal of the right wing drain it was found corroded closed with indication it has not functioned for an extended time. Engine controls were stiff but moved the full range of travel. Piston faces on the left engine were generally clean and free from deposits, erosion or fouling. The piston faces on the right engine showed consistent signs of fouling and carbon deposits as well as erosion on the edges of the valve recesses. Compressions were taken cold and are as follows relative to a max of 80PSI;

Left: 58/13/20/12/60/66

Right: 60/72/25/45/22/60

Left Engine:

- 1) #6 cylinder lower spark plug wire connector was hand tight.
- 2) Upper spark plug in #1 cylinder over torqued, all lower plugs and the upper plugs on cylinders 2, 4 and 6 were not torqued and installed slightly higher than hand tight.
- 3) Cylinder 1 lower plug fouled.
- 4) Cylinder 3 upper plug fouled and lower plug fouled and improperly gapped.
- 5) Cylinder 5 lower plug improperly gapped.
- 6) Improper hardware installed on fuel lines between flow divider and cylinders.
- 7) Back nut on propeller governor rod end attachment was loose.
- 8) Exhaust gasket on #6 cylinder showed signs of failure and leakage.
- 9) Upper left engine mount tube had previously been dented and a support gusset bent.
- 10) Borescope inspection shows indication that the exhaust valve in cylinder 3 was not seating properly.
- 11) Fuel servo screen appeared no with no contamination. It appeared to be either new or freshly overhauled with new gaskets installed. Fuel from the servo supply line was clean.

However, the fuel coming out of the servo had an orange coloring consistent with residual oil or preservative.

12) Flow divider cover not safetied.

Right engine:

- 1) All spark plugs were torqued improperly with cylinder 1 and 3 top and 6 bottom plugs breaking free when trying to remove the ignition wire back nut.
- 2) Cylinder #6 exhaust gasket shows indication of being blown.
- 3) Cylinder # 2 lower plug was oil filled.
- 4) Cylinder #2 and #3 were lead fouled with large chunks of debris lodged between the case and insulator.
- 5) Fuel servo finger screen showed contamination with a reddish brown substance consistent with corrosion.
- 6) During disassembly of the flow divider 2 chunks of corrosion debris were found in the plunger orifice. The chunks were slightly smaller than a BB but if lodged in the orifice in the piston would obstruct 60-75% of the opening.
- 7) Corrosion debris found in the 45 degree inlet fitting on the flow divider.
- 8) Standing oil found in the #2 cylinder
- 9) Throttle cable was improperly installed and the cable itself had broken off from the housing. Although the cable was moving the throttle arm when the control was moved the excessive bends, almost 90 degrees, are improper and when met with even minimal resistance it is likely to have caused an issues in actuating the throttle arm throughout the full range of travel.

Summary:

Throughout the inspection there were consistent examples of improper work practices evidenced by improper hardware, missing or improper safeties, and improperly torqued items. The compressions on the left engine are significantly below serviceable limits and would likely cause the engine to fail to produce sufficient power to sustain single engine flight in a situation where it was the only engine operating. Both engines had very little fuel in the supply line from the fuel pump to the fuel servo inlet consistent with fuel starvation.

Probable cause:

[REDACTED]

[REDACTED]

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