



Memorandum For Record

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NTSB Accident Number: ERA20LA219

The excerpts below are cut and paste from the engine examination which was performed on December 17, 2020, via Zoom.

The lower engine cowling was removed. Fire damage was noted to the flexible fuel and oil hoses, and electrical wires in the engine compartment area. There was also fire damage near the carburetor, which was broken off from the oil sump/induction manifold. The flexible fuel line from the airframe fuel strainer to the carburetor was broken and fire damaged. The forward side of the firewall forward sustained most of the heat damage. The airbox was pushed back. The oil cooler lines on the aft side of the baffling were heat damaged.

Prior to removal of all upper spark plugs¹, all ignition leads and spark plugs were tightly installed. He removed the upper spark plugs from each cylinder and placed them in a tray reported the following:

- 1T- Normal wear (short service time). Insulator tip light gray color. No lead deposits.
- 2T – Worn out- normal (normal service life). Insulator tip white (ash color), gap excessive. No lead deposits.
- 3T – Worn out – normal (normal service life). Insulator tip white (ash) color. No lead deposits.
- 4T – Newer plug. Normal wear (short service time). Insulator tip ash color. No lead deposits.

Because the propeller was removed a dowel was placed in the crankshaft flange to allow for manual rotation of the crankshaft. Attempts to rotate the crankshaft by hand were unsuccessful. The ignition leads were removed from the spark plugs and he reported no discrepancies. The lower spark plugs were removed from each cylinder and placed in a tray and reported the following for them:²

¹ All upper plugs were the massive electrode type

² All lower plugs were fine-wire type

- 1B – Spark plug hand tight. Normal wear (short service time). Insulator tip light tan color. Lead deposits were noted.
- 2B – The spark plug was just over hand tight. Normal wear (short service time). Insulator tip was smoky black color. Lead deposits were noted.
- 3B – Worn out – normal (normal service life). Insulator tip was smoky black color. Lead deposits were noted.
- 4B – Normal wear (short service time). Insulator tip was smoky dark gray. Heavy lead deposits were noted.

The crankshaft was rotated in the direction of rotation through 360° and the lower spark plugs were re-installed in their respective cylinders. Because the propeller was not installed safety concerns prevented performing a cold differential pressure test of each cylinder. During rotation of the crankshaft the impulse coupling was heard to operate once. Hand thumb suction and compression was checked for each cylinder during hand rotation of the crankshaft with the following results:

- #1 – Weak
- #3 – Strong
- #2 – Weak
- #4 – Weak to None

The interior of each cylinder was borescope inspected and pictures were taken. The following observations for each cylinder were reported:

- #1 – Unremarkable. The valves appeared Ok.
- #3 – Unremarkable. The valves appeared Ok.
- #2 – Unremarkable. The valves appeared Ok.
- #4 – Loose debris was noted inside. Flaking of the piston dome deposits was noted. Normal wear of the valves was noted.

Following the borescope inspection, the No. 1 cylinder piston was placed at 20° before top dead center (BTDC) which was the magneto timing position, but the points of both magnetos were not reflected being open. Each magneto was tightly secured to the accessory case. Heat damage was noted to the exterior of both magnetos. The covers of both magnetos were removed and both magnetos exhibited extensive internal heat damage that destroyed the phenolic gears.

The intake and exhaust valve clearance were checked for all valves. The following results were noted:

- | | |
|-------------------------|-------------------------|
| #1 Intake – 0.006 inch | #2 Intake – 0.008 inch |
| #1 Exhaust – 0.008 inch | #2 Exhaust – 0.008 inch |
| #3 Intake – 0.006 inch | #4 Intake – 0.007 inch |
| #3 Exhaust – 0.008 inch | #4 Exhaust – 0.014 inch |