

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN24LA121

EXAMINATION SUMMARY

April 4, 2024

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A. ACCIDENT

Location: Watertown, SD
Date: February 25, 2024
Time: 1700 LCL
2200 UTC
Airplane: N38696, Piper PA-28-181, S/N 28-7790577

B. EXAMINATION SUMMARY

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C. SUMMARY

The examination was conducted with Lycoming in the maintenance hangar of the Lake Area Technical College at the Watertown Regional Airport on April 3, 2024. The examination consisted of both a visual and teardown inspection of the Lycoming O-360-A4M engine along with a cockpit inspection. The examination revealed a partially stuck open Exhaust Valve on the #2 Cylinder. The #2 Cylinder and associated components were retained for further examination.

D. DETAILS OF THE EXAMINATION

1.0 Airframe Examination

1.1 Cockpit

Cockpit engine controls for the throttle and mixture were actuated and smooth travel to the stops was observed. The carburetor heat cockpit control was actuated and found to only move to the mid-range travel from OFF to ON.

The Cockpit Fuel Selector was found to be selected to the LEFT Fuel Tank.

2.0 Engine Examination

The PA-28-181 was equipped with a 180 horsepower normally aspirated Lycoming O-360-A4M engine S/N L-42332-36E. The engine was factory overhauled by Lycoming Engines (W.O. MS-58093) on January 24, 2023 and installed by Lake Area college mechanics on March 30, 2023. At the time of installation, the engine had 4,811.9 hours since new. The engine had accumulated 646.6 hours since major overhaul as of February 23, 2024 which was documented in an oil change two days prior to the accident flight.

Visual examination of the engine prior to teardown showed no issues or abnormalities. All engine controls cables, fluid lines, and instrumentation cables were found secured with no abnormalities present. The engine was clean with no oil observed on the exterior of the engine. The cowling was secured with no damage or abnormal fluid deposits observed.

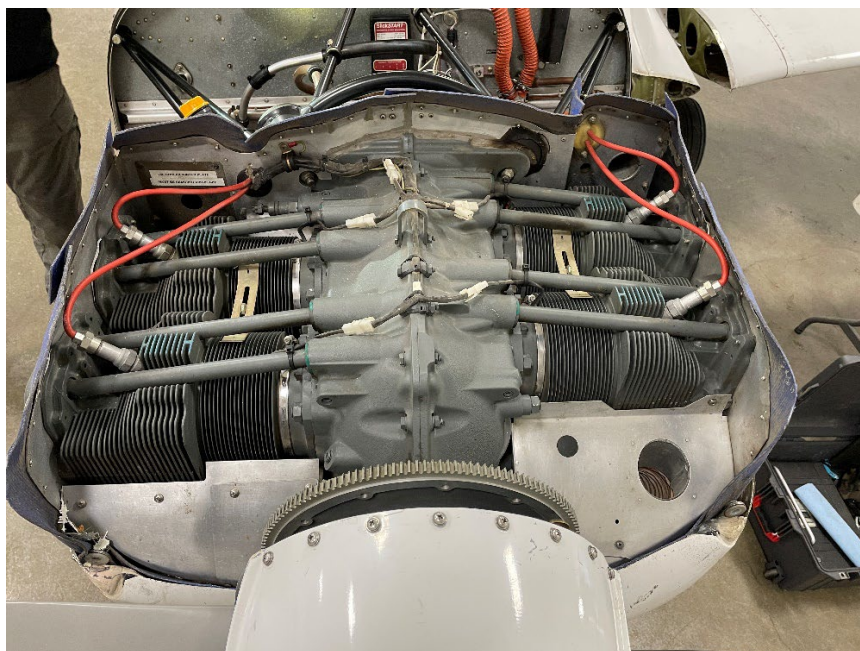


Figure 1. Engine prior to examination teardown

Oil dipstick was removed, and oil level observed at 8 quarts with relatively clean oil. Oil filter showed the oil was changed two days prior to the accident with an engine tach time of 5229.4. The filter was removed and examined with no metal observed in the media. Additionally, the oil screen was removed from the sump and examined by holding the screen next to an overhead light. No debris was observed and the oil was clean in appearance.

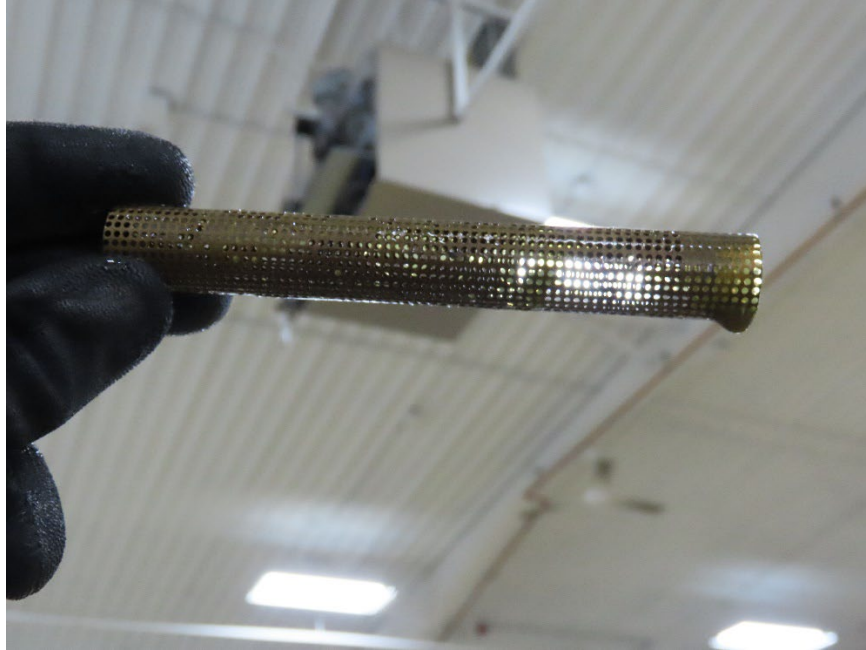


Figure 2. Oil Screen

Spark Plugs were removed and observed to be all normally worn, except the lower spark plugs of Cylinder #3 and #4, as compared with the Champion Spark Plug Card. Lower spark plugs from Cylinder #3 and #4 had debris and lead fouling consistent with combustion deposits and produced a weaker spark on only one side when bench tested. The rest of the spark plugs produced a normal spark when bench tested.

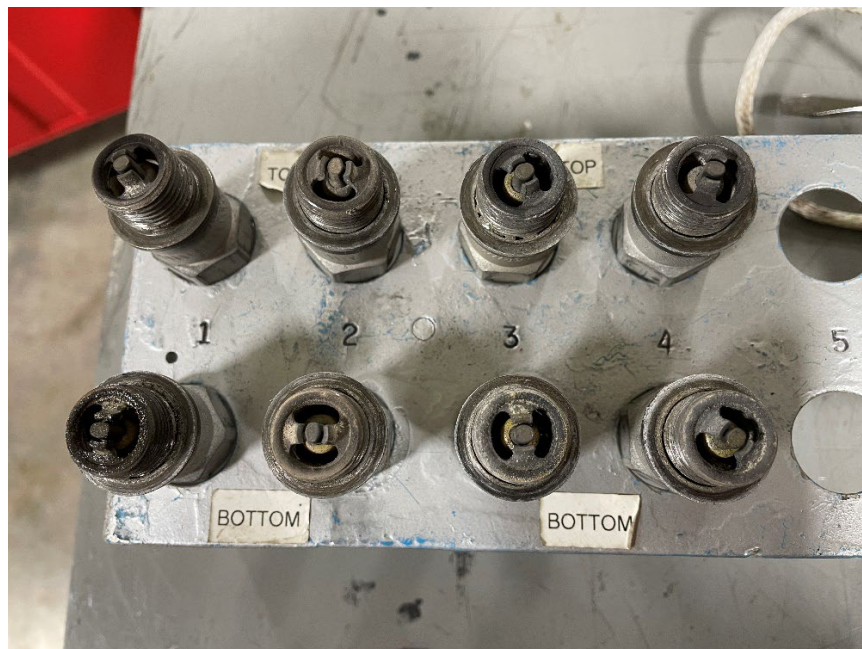


Figure 3. Spark Plugs

The engine driven fuel pump and the left and right magnetos were removed, examined, and bench tested with no observed abnormalities.

The carburetor was removed and examined with no observed abnormalities. The carburetor bowl still contained blue fluid consistent with 100LL Avgas. The fluid tested negative for the presence of water with the use of a color changing paste.

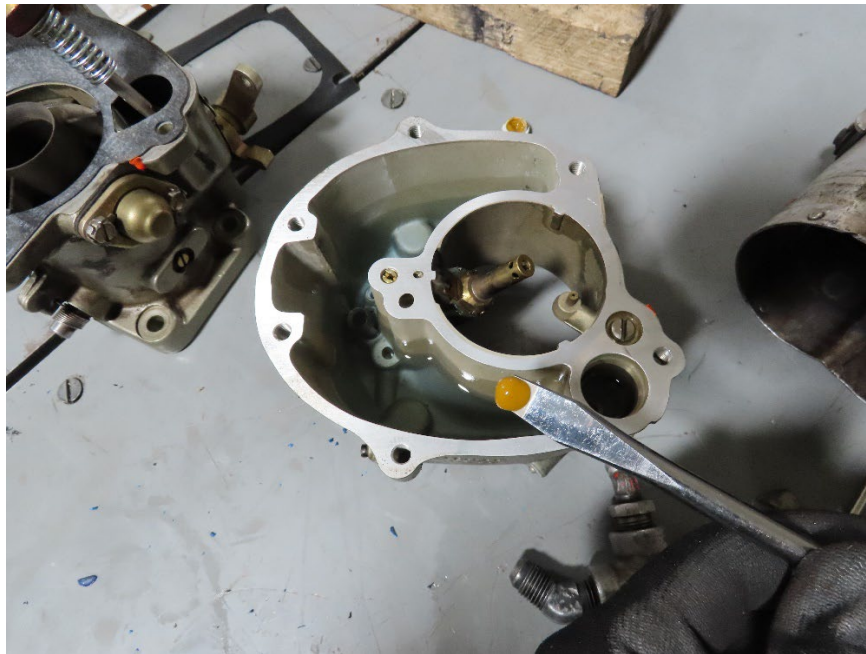


Figure 4. Carburetor Bowl with Negative Water Test

The carburetor floats also showed no signatures of hydraulic deformation or fluid within the floats. The carburetor fuel screen was removed and a flashlight was shined through the screen. No debris or foreign material was observed and the screen was intact.



Figure 5. Carburetor Fuel Screen

The engine crankshaft was rotated by hand with the propeller and engine continuity to the accessory section was observed. Normal valve movement was observed on Cylinders #1, #3, and #4. The #2 Cylinder Exhaust Valve was found to have zero movement and was stuck in a partially open position.

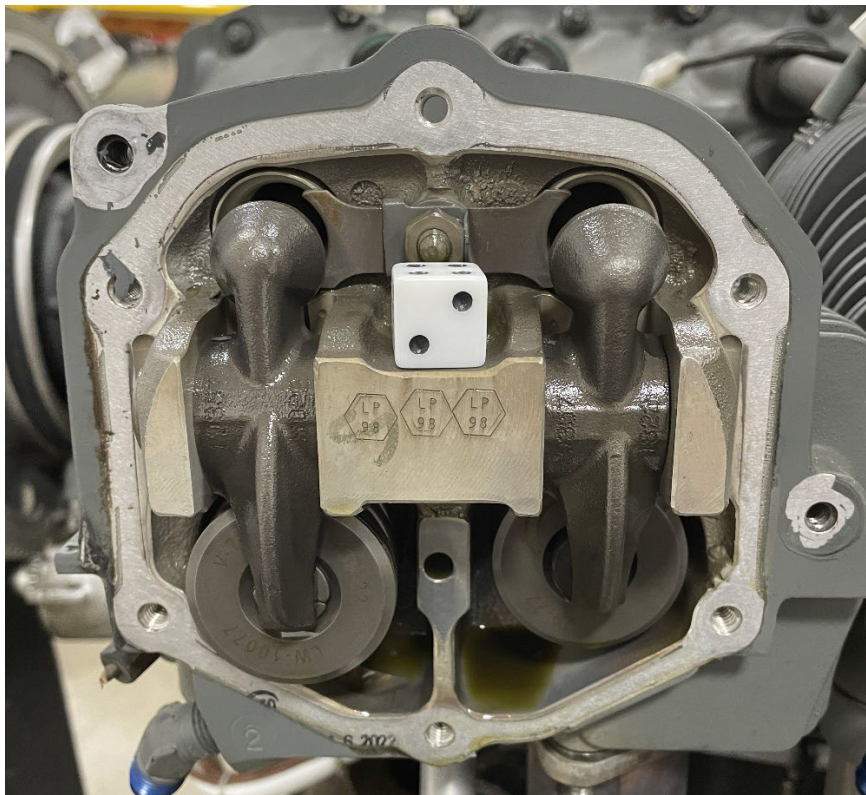


Figure 6. #2 Cylinder with stuck Exhaust Valve (Right)

A thumb compression test was performed on all cylinders with the #2 Cylinder having no observable compression. The #2 Exhaust Valve Push Rod and Rocker were observed to have normal range of movement when the engine was rotated by hand. The exhaust push rod was rolled on a granite table and found to be straight.

The #2 Cylinder was removed from the engine case and examined. The exhaust valve was found stuck in a partially open position. The exhaust valve face was unremarkable with a slight metallic sheen on the outer diameter of the face.



Figure 7. #2 Cylinder Inside View with Open Exhaust Valve (Upper)

The exhaust valve was removed with the use of penetrating oil and a mallet. The valve was found to have a metallic like debris smeared at mid span. The stem was examined using a 10x power jeweler's loupe.



Figure 8. Metallic Like Debris on Exhaust Valve Stem

The cylinder valve guide was examined with a borescope and found to have foreign debris along about $\frac{3}{4}$ of the guide length. The piston head was found to have a circular area of removed combustion deposits in the location of the exhaust valve. Additionally, a slight imprint of the exhaust valve was observed in locations along the circular area.



Figure 9. Circular Impression within Deposits on the Piston Head

The #2 Cylinder and associated components were retained and shipped to the Lycoming Engines Laboratory for further analysis.

3.0 Propeller Examination

The propeller was found to be intact with no rotational bending or s bending. The blades were identified a Blade A and Blade B for documentation purposes. Only a slight aft bend was observed in blade A at 16 inches from the tip.



Figure 10. Propeller Blade A with Aft Bend.

Submitted by:

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