

# National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR23LA218

## **AIRFRAME & ENGINE EXAM**

September 19, 2023

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## **A. ACCIDENT**

Location: Chillicothe, Missouri  
Date: June 6, 2023  
Time: 1454 central daylight time  
Airplane: Cessna A188B, N731UF

## **B. AIRFRAME & ENGINE EXAM**

|                   |                                                                                      |
|-------------------|--------------------------------------------------------------------------------------|
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## **C. SUMMARY**

On June 7, 2023, about 1454 central daylight time, a Cessna A188B, N731UF, was substantially damaged when it was involved in an accident near Chillicothe, Missouri. The pilot sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 137 agricultural flight.

## **D. DETAILS OF THE EXAMINATION**

### **1.0 Airframe Examination**

Examination of the recovered wreckage revealed that the cockpit, fuselage structure was mostly destroyed by thermal and impact damage. The engine, engine mount, firewall, main landing gear, instrument panel, flight controls, and seats were separated, exhibited thermal and impact damaged throughout.

Flight control continuity was established from the primary flight controls to the primary flight control surfaces. All areas of separation were consistent with overload or were cut by recovery personnel. The flap control handle was observed in the 10° position.



**Figure 1: View of fire damage to cockpit (photo courtesy of Textron Aviation)**

The left wing strut was separated at the wing root. The forward left wing attachment was cut. The aft left wing bolt was removed. Thermal damage was observed at the wing root. The left wing aileron and flap remained attached to the wing attachment points. Crushing and bending was observed to the wing tip and near the wing root.

The right wing was separated at the wing root and fragmented into several sections. Thermal damage was observed at the wing root. A section of about 6 ft of the right wing inboard section with the aileron attached to the wing attachment points was

observed. The right wing flap was separated, thermal and impact damaged was observed throughout.

The empennage separated from the fuselage and was thermal damaged near the aft fuselage. The vertical stabilizer, horizontal stabilizer, rudder and elevator remained attached. No damage was observed to the right horizontal stabilizer, rudder and vertical stabilizer. Damage was observed to the trailing edge of the right elevator. The left horizontal stabilizer and elevator bent inward, crushing and bending was observed throughout. The rudder flight control cables and elevator flight control cables remained attached to their respective mounts.



**Figure 2: View of empennage damage (photo courtesy of Textron Aviation)**

## **2.0 Engine Examination**

Engine Manufacturer: Lycoming  
Engine Model Number: IO-540-K1A5  
Engine Serial Number: L-6748-48

Examination of the recovered engine revealed that the engine separated from the engine mounts, impact and thermal damage was observed throughout. All six cylinders remained attached to the engine. Damage was observed to the oil sump and intake plenum. The fuel servo was separated from the intake flange. Damage was observed to the rocker box cover area of the number 4 cylinder. The propeller and propeller hub remained attached to the engine crankshaft. The exhaust remained attached, bending and crushing was observed throughout. The oil dip stick was not observed with the recovered wreckage.

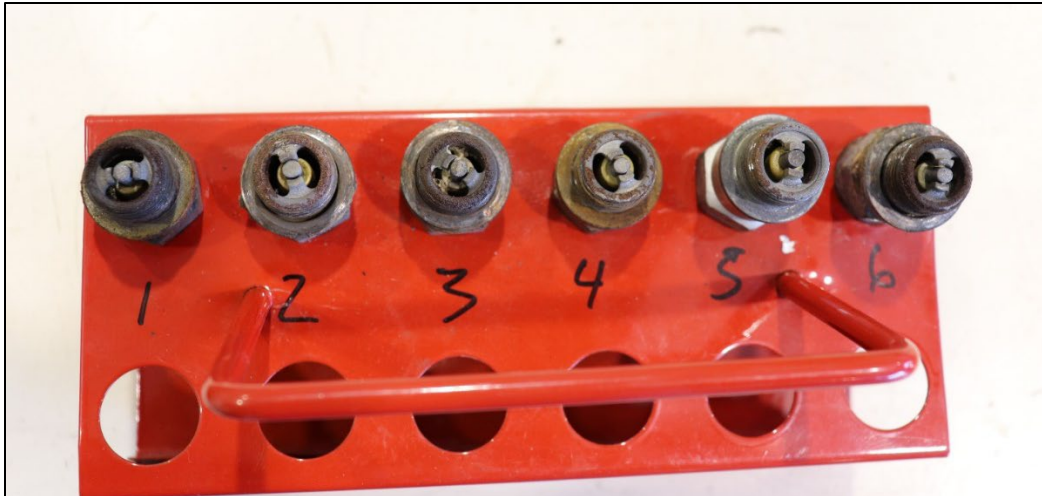


**Figure 3: View of engine during examination**

The rocker box covers were removed. With the exception of the number 4 cylinder, the intake and exhaust rocker arms were intact, and oil coated. With the exception of the number 4 cylinder, the intake and exhaust valve springs were in place and visually appeared to be undamaged. The upper spark plugs were removed, and all six cylinders were examined internally using a lighted borescope. A normal amount of combustion deposits was observed within the combustion dome of each cylinder and piston face. All of the intake and exhaust valves were unremarkable. The crankshaft was rotated by hand using the propeller. Rotational continuity was established throughout the engine and valve train, with the exception of the number 4 & 6 cylinder exhaust valves. Damage to the number 4 & 6 cylinder exhaust valves was observed, consist with impact damage. Thumb compression and suction was obtained on all six cylinders.

The number 4 cylinder was removed, no damage was observed within the combustion dome or piston face. Damage to the rocker box area was consistent with impact damage.

The upper spark plugs were removed from the engine, and they were the massive electrode type. All sparkplugs exhibited gray deposits within the electrode area. Very little gap was observed on the number 5 & 6 upper sparkplugs. All of spark plugs exhibited signatures consistent with worn-normal when compared to the Champion Check-A-Plug comparison chart.

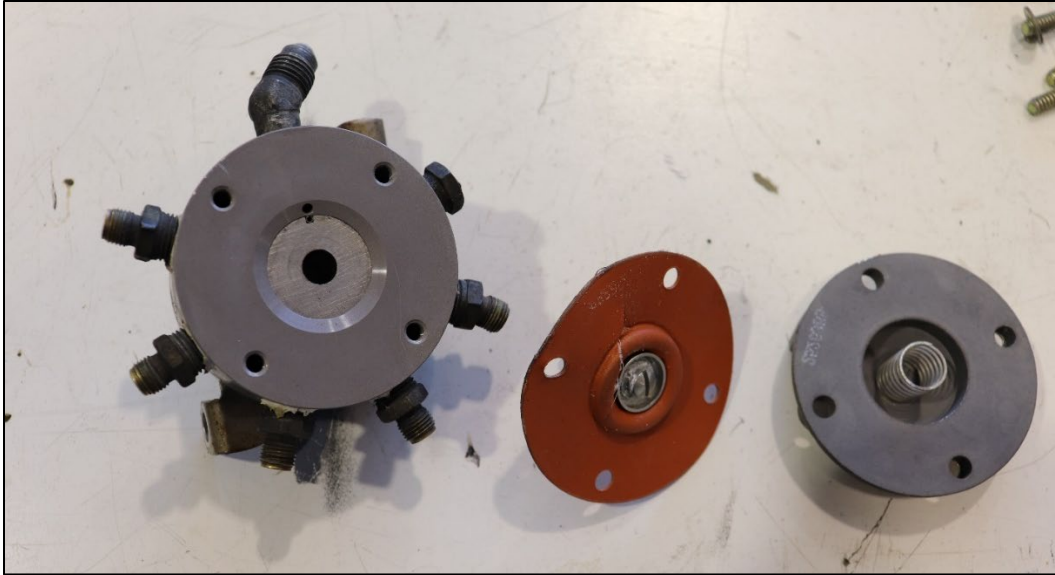


**Figure 4: View of engine spark plugs during examination**

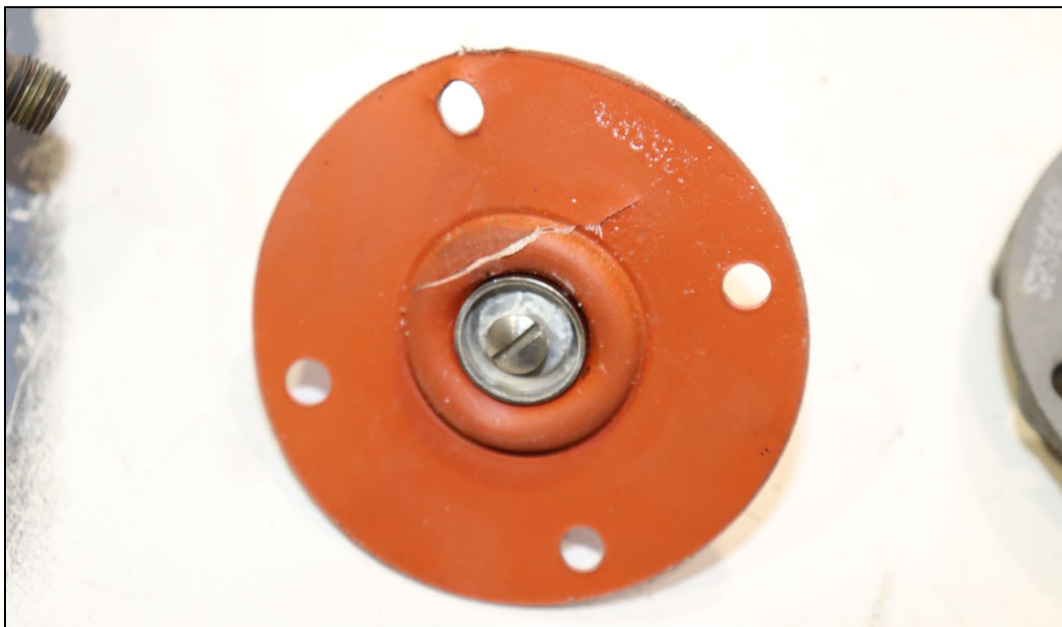
The left and right magneto remained attached to the engine accessory case, thermal damage was observed to the magneto cases. The magneto hold down hardware was found to be lacking torque, consistent with exposure to fire. The left magneto was removed and would not rotate, consistent with thermal damage. The left magneto was disassembled, and damage consistent with post-crash fire was observed. The right magneto was removed and rotated using a hand tool, no spark was observed. The right magneto cap was removed, damage was observed to the ignition leads, consistent with impact damage. The right magneto was disassembled, and damage consistent with post-crash fire was observed. Due to extensive thermal damage, a functional test could not be performed.

The fuel servo was not observed within the recovered wreckage.

The fuel flow manifold remained attached to its respective mount and was undamaged. The number 6-cylinder fuel line and nozzle pressure gage fitting were fracture separated. The fuel manifold assembly was removed and subsequently disassembled. The internal diaphragm exhibited an approximate 1.1 inch long tear and the spring was undamaged. The fuel manifold was clear and free of debris.



**Figure 5: View of fuel manifold disassembled**



**Figure 6: View of fuel manifold diaphragm**

All six fuel injector nozzles were removed from the cylinders and were found to be free of debris.

The engine driven fuel pump remained attached to the engine and was thermal damaged. The fuel pump was removed and would not rotate by hand, consist with thermal damage.

The propeller governor remained attached to the engine. The propeller control cable remained attached to the propeller governor arm. The propeller governor was

removed. The propeller governor arm moved freely from stop to stop. Using a hand tool, the propeller governor rotated freely. The oil screen was clean.

### **3.0 Propeller Examination**

Propeller Manufacturer: Hartzell  
Propeller model: F8475T+2  
Propeller Serial Number: J56443

The airplane was equipped with a two blade Hartzell propeller; for the purposes of this report the propeller blades were labeled A & B. Propeller blade A exhibited S bending about mid span, with polishing along the leading edge, along with unidirectional striations on the cambered side of the blade. Blade B exhibited bending aft about mid span, with unidirectional striations on the cambered side of the blade. Additionally, about a 4-inch section of the propeller blade tip was fracture separated.



**Figure 7: View of airplane propeller during examination**

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