

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR22LA334

ENGINE EXAMINATION PARTICIPANTS

February 1, 2023

TABLE OF CONTENTS

A. ACCIDENT.....	3
B. ENGINE EXAMINATION PARTICIPANTS.....	3
C. SUMMARY	3
D. DETAILS OF THE EXAMINATION.....	4
1.0 ENGINE EXAMINATION	4

A. ACCIDENT

Location: Medicine Bow, Montana
Date: September 5, 2022
Time: 1030 Mountain daylight time
Airplane: N444MR Long EZ

B. ENGINE EXAMINATION PARTICIPANTS

Investigator Eleazar Nepomuceno
National Transportation Safety Board
Federal Way, Washington

Party Member Tory Helgeson
Textron Aviation Inc. Lycoming
Greely, CO

C. SUMMARY

On September 5, 2022, about 1030 Mountain daylight time, an Edward Long EZ, N444MR, was substantially damaged when it was involved in an accident near Medicine Bow, Wyoming. The pilot and passenger sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to the passenger, she and the pilot were on a cross-country flight from Kanab Municipal Airport (KKNB) Kanab, Utah, to Chadron Municipal Airport (KCDR), Chadron, Nebraska. While enroute, about 7,500 ft mean sea level (msl), the airplane started to violently shake. The pilot initially maneuvered towards a local airport but decided to land the airplane on a highway. Shortly after touchdown, the airplane veered off the road and impacted terrain. Subsequently, the airplane nosed over and sustained substantial damage to the fuselage.

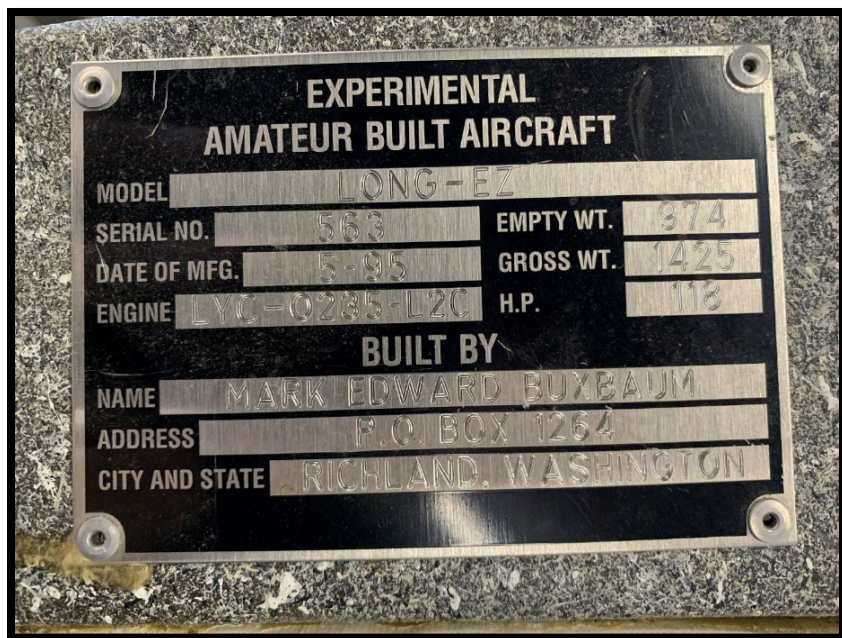


Figure 1. View of airplane data plate

D. DETAILS OF THE EXAMINATION

1.0 Engine Examination



Figure 2. View of engine data plate

The installed engine, a Lycoming O-235-L2C, serial no. RL-12827-15, was remanufactured and zero timed by AVCO Lycoming Factory Service Department Engine on November 24, 1981 (figure 2). According to the pilot, the engine had not been overhauled, with only cylinder no. 1 being replaced due to low compression. Engine logbook records revealed that no. 1 cylinder was installed on 6/27/2017.



Figure 3. View of engine and propeller

The engine remained attached to all 4 engine mounts (figure 3). Continuity of the throttle, mixture, propeller control cables were confirmed from the engine back to the cockpit area.

All engine accessories remained attached to its mounting pad. The aft right corner of the engine oil case sustained impact damage; the oil case was void of oil. The oil sump screen was removed, and no debris was found within the screen. The carburetor separated at its mounting base consistent with impact damage. The oil pump was removed, and the filter screen revealed no metal debris. The mechanical fuel pump was removed and found unremarkable; residual fuel was found with the fuel line connected to the pump. The fuel filter bowl was removed, and no fuel was recovered. The fuel filter micron screen had no debris. The vacuum pump was removed and found unremarkable.

The wooden propeller, a Ted Hendrickson model no. 62 x 66, sustained damage consistent with impact. One side was splintered at various lengths, starting about 12 inches from the root, while the other side was splintered more similarly about 6 inches from the root.

All top spark plugs were removed (figure 4) and revealed that all spark plugs had each of its ground and central electrodes intact; all electrodes had oil carbon residue.



Figure 4. View of all top spark plugs from accident engine

After all top spark plugs were removed, the cylinder wall and pistons were visually examined and revealed that the no. 4 cylinder had mechanical gouges to the piston and cylinder. All rocker box covers were removed and revealed that cylinders no. 2, 3, and 4 had severe oil and carbon residue on its valve springs, consistent with exhaust blow-by (figure 5). Each cylinder was removed for further examination.

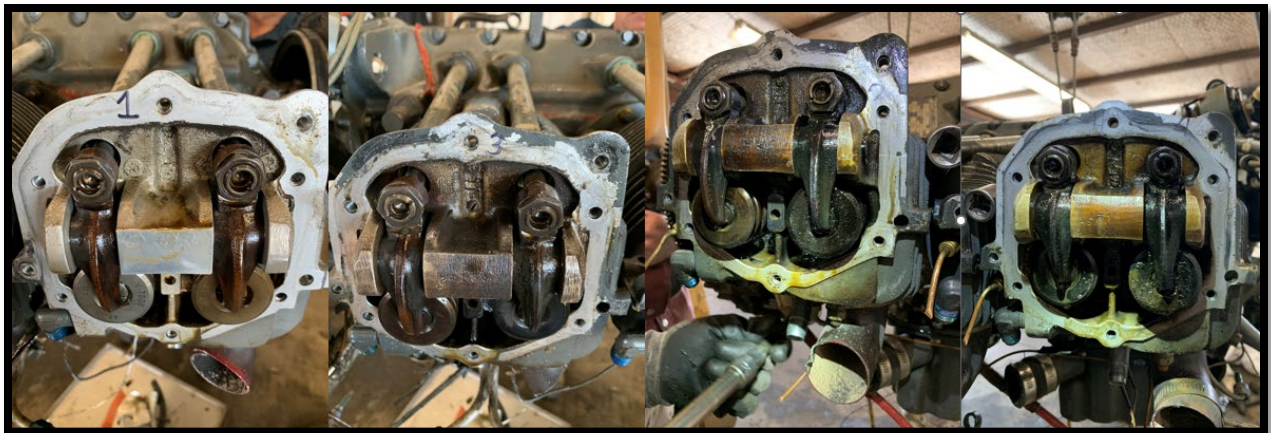


Figure 5. View of valve rockers and springs after rocker box cover removal (4 total views)

Removal of piston no. 1 and 2 revealed no mechanical anomalies; pistons no. 3 revealed no mechanical anomalies but had an excess of oily carbon buildup; and piston no. 4 revealed mechanical damage on its face (figure 6).



Figure 6. View of piston faces with mechanical damage to piston no. 4 (4 total view)

Examination of cylinder no. 4 revealed that the no. 4 valve face. A section of the exhaust valve stem and the valve head was separated and not found within the engine; the intake valve and head remained intact (figure 7). Gouging and scoring was found on the cylinder wall adjacent the valve seats consistent with mechanical damage from the broken valve face and stem.

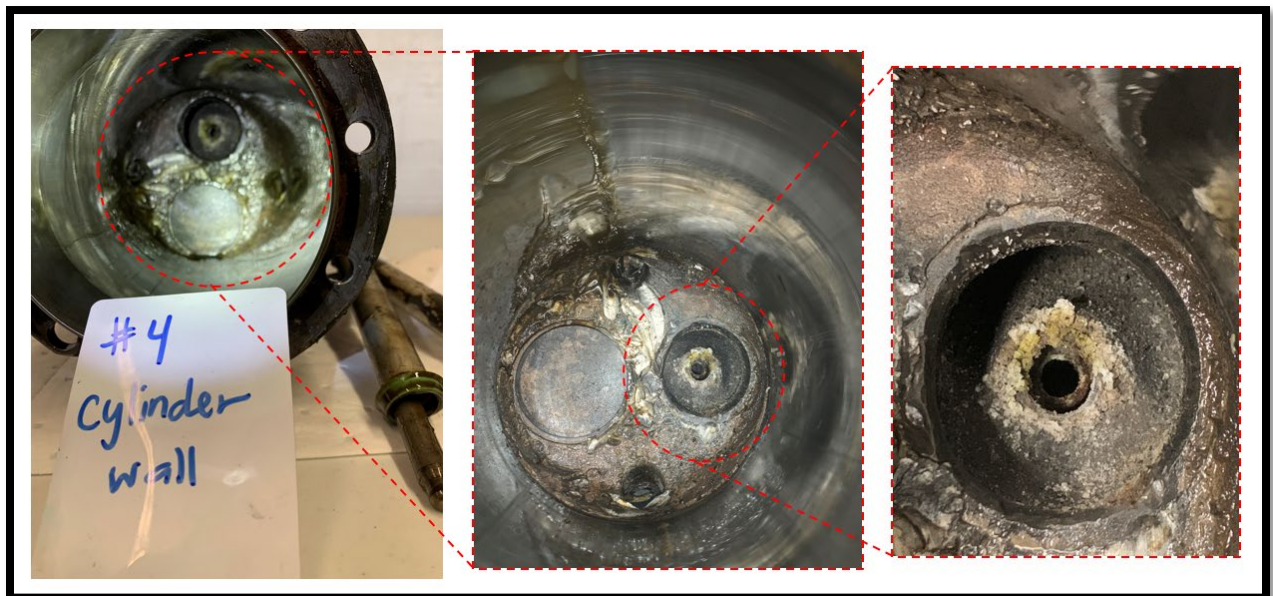


Figure 7. Left photo: View of no. 4 cylinder wall; center photo: close-up view of intake and exhaust valve heads; right photo: close-up view of damage to exhaust valve stem and seat

The exhaust valve stem had excessive play within the valve guide. It was manually forced out of the valve guide and revealed excessive oily carbon buildup around and within the exhaust valve guide and seat (figure 8). According to the manufacturer, the exhaust valve should measure about 4.3 inches in length contrasting the remaining exhaust valve stem which measured about 3.5 inches (figure 9).

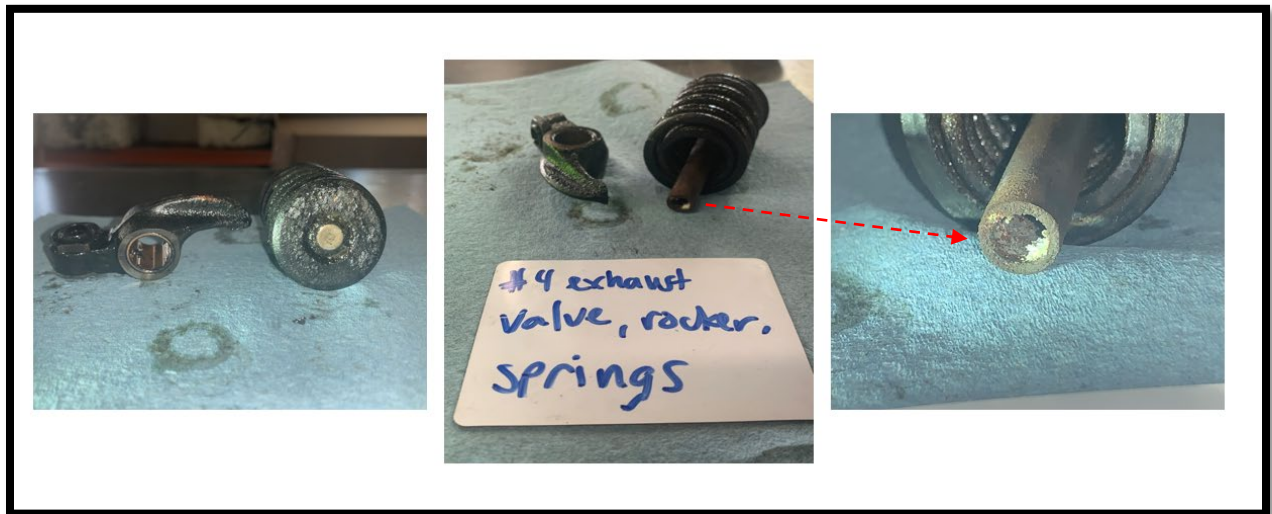


Figure 8. Left and center photos: view of fore and aft section of no. 4 exhaust valve spring, stem, and rocker; right photo: closeup view of damaged no.4 exhaust valve stem



Figure 9. View of No. 4 cylinder exhaust valve measurement

Submitted by:

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