

**NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594**

SUMMARY OF ENGINES AND PROPELLERS EXAMINATION

CEN22FA145

A. ACCIDENT

Location: Pond Creek, Oklahoma
Date: March 17, 2022
Time: 4:38 pm Central Daylight Time
Aircraft: Piper PA-30 (S/N 30-1504) N8357Y

B. PARTICIPANTS

David Bowling
Senior Air Safety Investigator
National Transportation Safety Board
Denver, Colorado

Richard Stevens
Air Safety Inspector
Federal Aviation Administration
Wichita, Kansas

Jonathon Hirsch
Air Safety Investigator
Piper Aircraft, Inc.
Vero Beach, Florida

David Harsanyi
Air Safety Investigator
Lycoming Engines
Williamsport, Pennsylvania

Les Doud
Air Safety Investigator
Hartzell Propeller
Piqua, Ohio

C. ACCIDENT SUMMARY

On March 17, 2022, about 1638 central daylight time, a Piper PA-30 airplane, N8357Y, was destroyed when it was involved in an accident near Pond Creek, Oklahoma. The pilot and 2

passengers were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

Preliminary radar and Automatic Dependent Surveillance-Broadcast (ADS-B) data indicated the airplane first appeared at 1509 about 1.5 nautical miles west of the Mineral Wells Regional Airport (MWL), Mineral Wells, Texas. The airplane tracked north climbing initially to a cruise altitude of 8,500 ft and then later climbing to 16,500 ft. The airplane began descending after passing over Vance Air force Base (END), Enid, Oklahoma and turned momentarily eastbound. The airplane then turned westbound and back to the north while descending and decreasing in ground speed from over 200 knots to under 100 knots. Mode C position reporting data was lost followed by the loss of all track data about 1631. The airplane was about 5 nautical miles southwest of Pond Creek, when track data was lost.

The airplane was never in contact with Air Traffic Control.

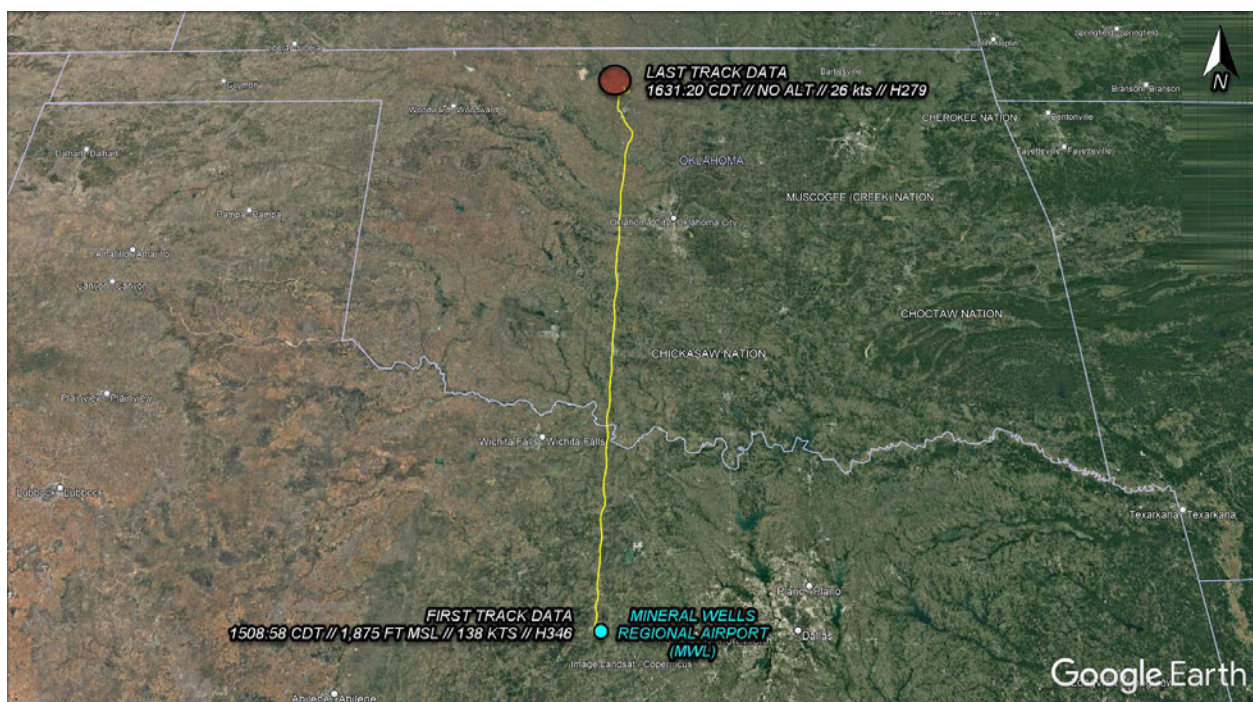


Figure 1. ADS-B Flight Track.

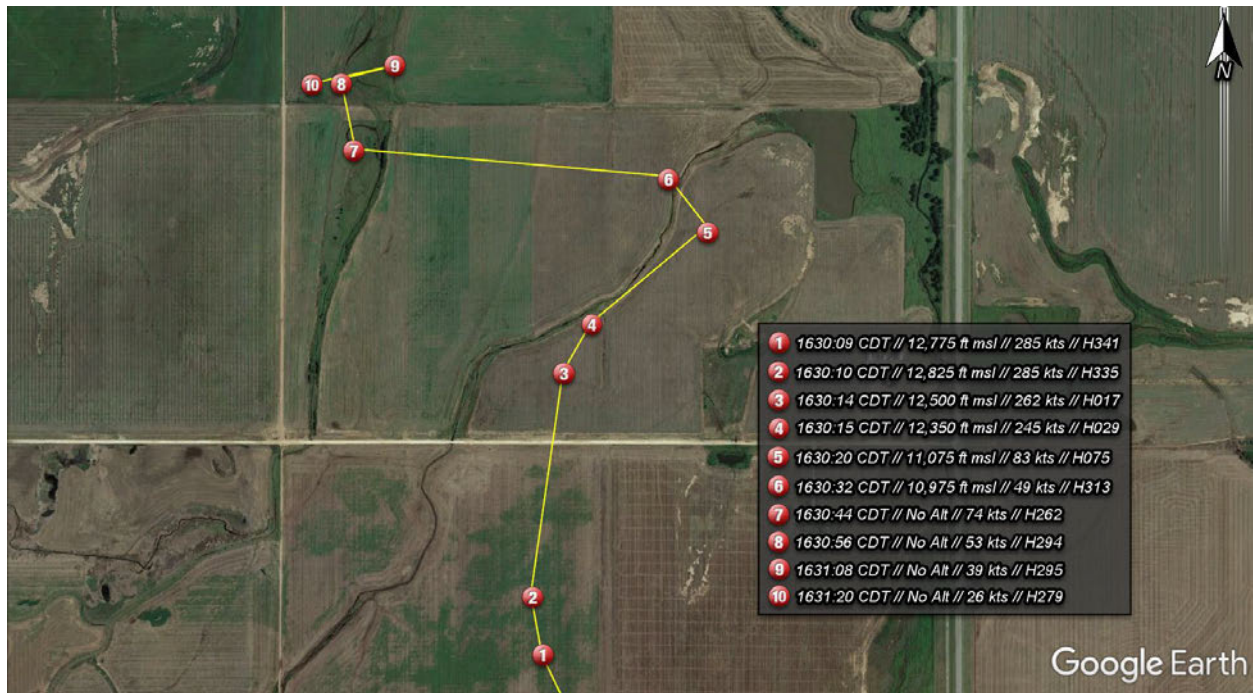


Figure 2. Radar Depiction of the End of the Flight Track.

A witness in the area reported he heard what sounded like engines revving. He looked up, saw the airplane coming straight down and videoed the airplane's last 8 seconds before it impacted terrain. The airplane was in a right-hand nose down spin. The video showed the airplane up to within moments of impact with the terrain when it went behind tall grass. In the video, the airplane's aft fuselage and empennage were separated.

The Automated Surface Observing System (ASOS) located at Enid Woodring Regional Airport (WDG), Enid, Oklahoma, located about 17 miles south-southeast of the accident location, at 1645 reported 5,000 ft scattered clouds, 7,000 ft scattered clouds, and 9,000 ft overcast ceiling, 10 miles visibility with temperature 70° F, dew point 45° F, wind 190° at 4 knots, and altimeter 29.64 in. HG.

D. DETAILS OF ENGINE AND PROPELLER EXAMINATION

The airplane was recovered and taken to Dodson International, Rantoul, Kansas. On May 24 and 25, 2022, the two engines and two propellers were disassembled and examined. The examination was overseen by the NTSB and an inspector from the Federal Aviation Administration, and air safety investigators from Piper Aircraft, Lycoming Engines, and Hartzell Propeller participated in the disassembly and the examinations. An airframe and powerplants mechanic from Dodson assisted in the disassembly and examinations.

E. SUMMARY OF ENGINE EXAMINATIONS

Left Engine Lycoming IO-320-C1A [s/n L-3231-55A]

The left engine was attached to the airframe. The remaining cowling was removed, and the engine was removed from the airframe and lifted for the examination. The front of the engine case was broken around the crankshaft fracture. The crankshaft was fractured about 3 inches aft of the flange. The fracture was consistent with torsional and sideload tearing. The front of the crankcase

was cracked and broken around the crankshaft fracture. The top and front cylinders of the engine showed crush damage. Several of the push rods and tubes were bent inward and aft. The engine was pushed aft into the firewall, concaving the firewall and crushing the engine mounts and accessory section.

The rocker box covers were removed, and the rockers examined. All rockers and springs for the intake and exhaust valves were intact. The bent push rods were removed, and the top spark plugs were removed and examined. The electrode on plug 2 was bent. Plug 3 was broken. Plugs 1 and 4 showed extended wear but were within operational tolerances when compared with a spark plug wear chart. All of the bottom spark plugs showed normal wear.

The vacuum pump was removed, and the engine was turned through the accessory case. The intact push rods moved freely, and all the corresponding rockers moved accordingly. Thumb compression was performed, and all four cylinders demonstrated adequate compression and release. Engine continuity was established.



Figure 3. Left Engine, Right Side, Cylinders 1 and 3



Figure 4. Left Engine, Left Side, Cylinders 2 and 4

In addition to the vacuum pump, the two magnetos, oil filter, oil screen, fuel pump, fuel injection servo, propeller governor, and turbocharger were removed and examined. The oil filter and screen showed no debris. The left magneto was intact. The right magneto showed impact damage. Impact damage was also noted on the fuel injector servo and the propeller governor. The oil screen showed oil and no debris. The turbocharger was intact, and the impellers moved freely. In summary, all the components examined showed no preaccident malfunctions or failures which would have precluded their normal operation.

Right Magneto, Bendix Model S4LN-21 [Serial No. 953843]

The right magneto showed impact damage. The leads were cut, and the impulse coupling was rotated. The coupling rotated but the leads showed no spark.

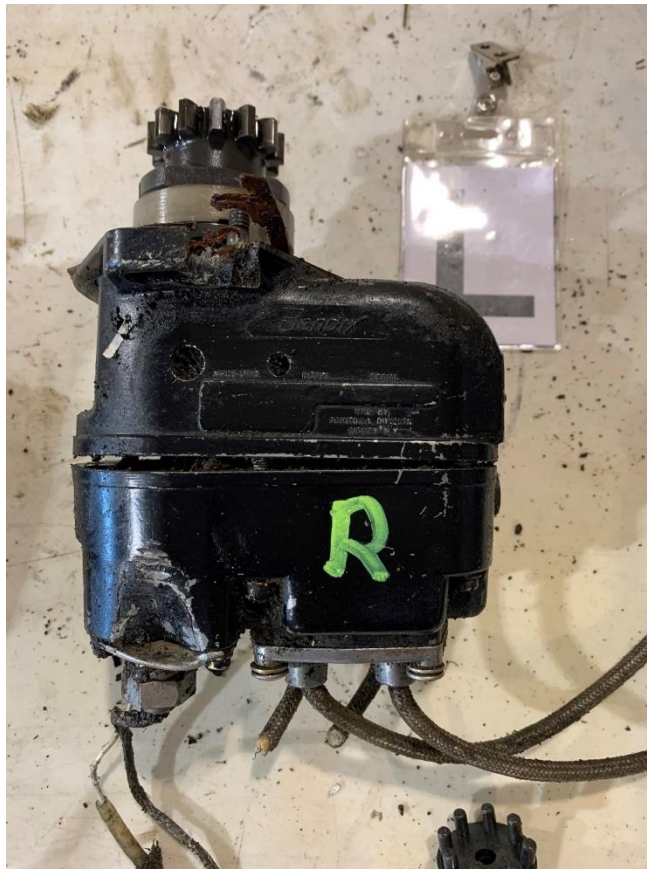


Figure 5. Right Magneto

Left Magneto, Bendix Model S4LN-21 [Serial No. 953842]

The left magneto was intact. The leads were cut, and the impulse coupling was rotated. Spark was observed at all four leads.



Figure 6. Left Magneto

Fuel Distribution Manifold

The fuel distribution manifold was opened. The diaphragm was removed and examined. The diaphragm showed no damage and was clean. No debris was observed in the manifold housing or the ports to the lines leading to the cylinders.



Figure 7, Disassembled Fuel Distribution Manifold

Oil Filter

The oil filter was intact and showed minor top crushing. The filter was removed and disassembled. Little oil was in the filter, but what oil observed was clean. The filter was opened and examined. No debris was noted. Information written on the filter showed it had been installed in May 2021.



Figure 8. Disassembled Oil Filter

Left Vacuum Pump

The left vacuum pump was fractured at the mount and the coupling was broken. On disassembly, the vanes were found to be fractured. All the tubes showed bends and crushing.

Left Engine Examination Summary

Engine continuity was confirmed. All physical damage to the engine was consistent with impact damage during the in-flight break up and subsequent ground impact.

Right Engine Lycoming IO-320-C1A [s/n L-3275-55A]

The right engine was lifted from its crate. Soil was removed and the firewall and engine mounts were removed. The rocker box covers were removed, and the rockers examined. All rockers for the intake and exhaust valves were intact and moved freely. Several pushrods and covers were bent. The aft pushrod tube to the right front cylinder showed corrosion. The

crankshaft was fractured about 4 inches aft of the flange. The fracture was consistent with torsional and sideload tearing. The front of the crankcase was cracked and broken around the crankshaft fracture. The top spark plugs were removed and examined. They showed excessive wear but were within operational tolerances when compared with a spark plug wear chart.

The vacuum pump was removed, and the engine was turned through the accessory case. The intact push rods moved freely, and all the rockers moved accordingly. Thumb compression was performed, and all four cylinders demonstrated adequate compression and release. Engine continuity was established.

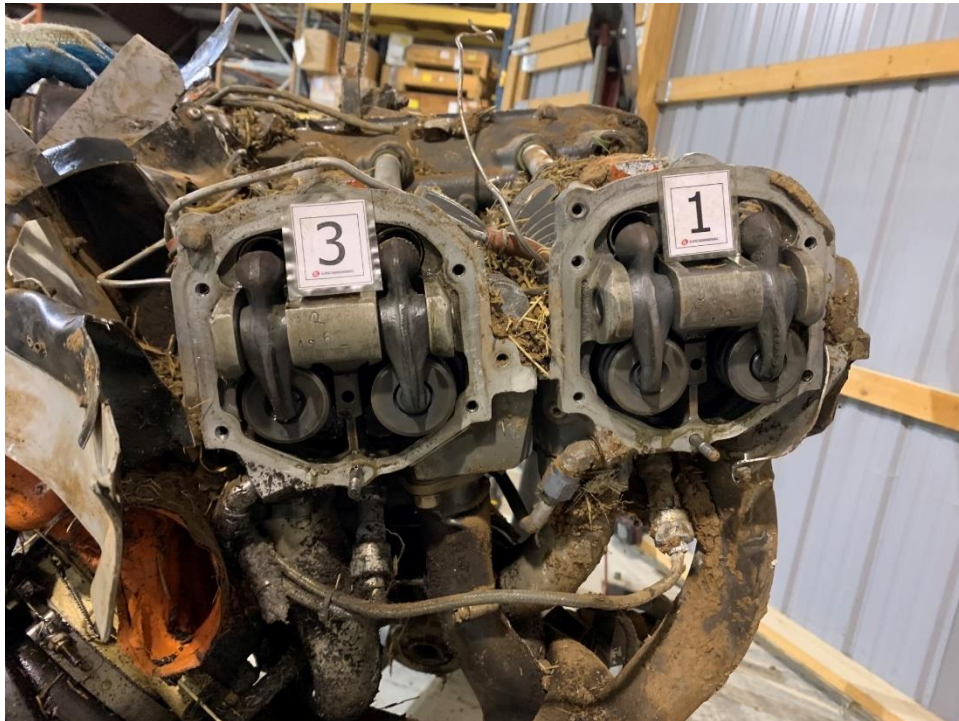


Figure 9. Right Engine, Right Side, Cylinders 1 and 3



Figure 10. Right Engine, Left Side, Cylinders 2 and 4

In addition to the vacuum pump, the two magnetos, oil filter, oil screen, fuel pump, fuel injection servo, propeller governor, and turbocharger were removed and examined. The oil filter and screen showed no debris. Both magnetos showed proper spark. In summary, all the components showed normal wear and no preaccident malfunctions or failures which would have precluded their normal operation.

Right Magneto, Bendix Model S4LN-21 [Serial No. 958337]

The right magneto was intact. The leads were cut, and the impulse coupling was rotated. Spark was observed at all four leads.



Figure 11. Right Magneto

Left Magneto, Bendix Model S4LN-21 [Serial No. 958338]

The left magneto was intact. The leads were cut, and the impulse coupling was rotated. Spark was observed at all four leads.



Figure 12. Left Magneto

Fuel Distribution Manifold

The fuel distribution manifold was opened. The diaphragm was removed and examined. The diaphragm showed no damage and was clean. No debris was observed in the manifold housing or the ports to the lines leading to the cylinders.

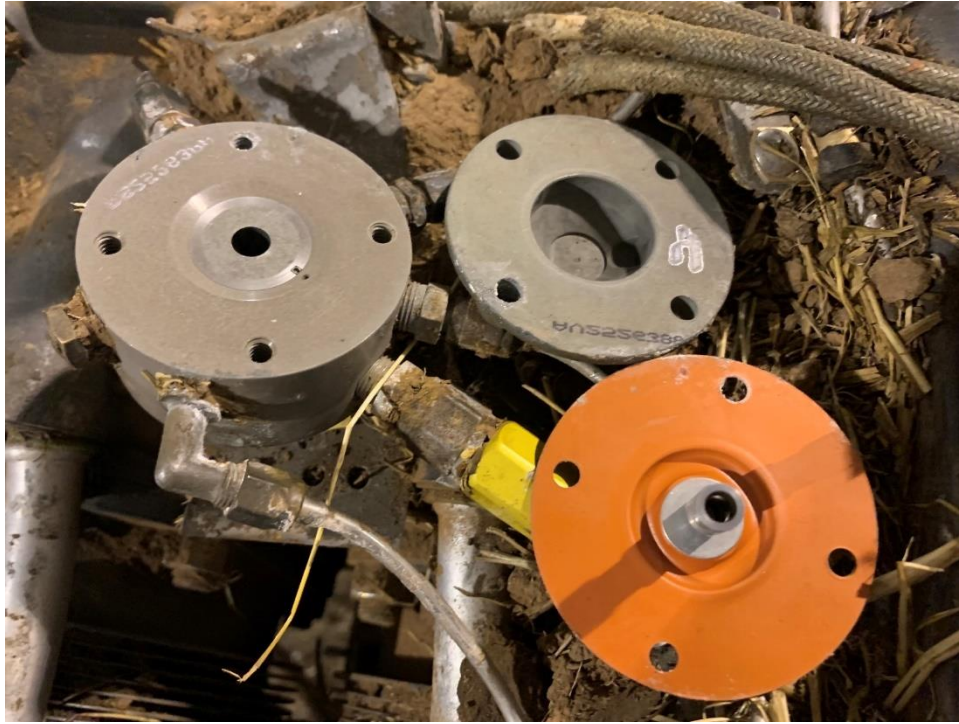


Figure 13, Disassembled Fuel Distribution Manifold

Right Vacuum Pump [Serial No. 07K610]

The right vacuum pump was intact, and the drive coupling rotated freely. On disassembly, the vanes were found intact. All the tubes were intact and showed minor bends.

Oil Filter

The oil filter was intact and showed minor top crushing. The filter was removed and disassembled. Little oil was in the filter, but what oil observed was clean. The filter was opened and examined. No debris was noted. Information written on the filter showed it had been installed in May 2021.



Figure 14. Disassembled Oil Filter

Right Engine Examination Summary

Engine continuity was confirmed. All physical damage to the engine was consistent with impact damage during the in-flight break up and subsequent ground impact.

F. SUMMARY OF PROPELLERS EXAMINATIONS

Left Propeller [Hartzell HC-E2YL-2BSF, Hub Serial No. 2901]

The left propeller consisted of four main pieces, the two propeller blades, the hub extension with the flange and about 4 inches of the crankshaft, and the piston cylinder with part of the spinner still attached. Blade A was broken out of the hub and was c-shaped aft beginning at mid span. A large part of the trailing edge was broken out due to impact. Three inches of the blade tip was broken off. The back side of Blade A showed several impact marks to include of the three hexagonal bolt imprints within the c-shaped bend.



Figure 15. Left Propeller, Blade A, Front Side



Figure 16. L Propeller, Blade A, Back Side

Blade B was intact and bent slightly aft. The blade showed little damage.



Figure 17. Left Propeller Blade B

The hub was broken at the propeller mounts. The hub extension and flange were intact. A 4-inch section of the left engine crankshaft remained attached to the flange. The crankshaft fracture showed torsional and sideload bending and breaking. The hub extension was disassembled, and the springs examined. The inner and outer springs were intact but slightly bent and stretched.

The piston cylinder was broken out at the base ring. A portion of the spinner remained attached to the cylinder. The piston was wedged solidly in the cylinder. The remaining spinner was torn and broken laterally and aft.

One of the two left propeller preload plates showed several faint witness marks. The marks corresponded with blade angles of 32 to 36 degrees or high-speed cruise.



Photo 18. Left Propeller Preload Plate

Left Propeller Examination Summary

All physical damage to the propeller was consistent with impact damage during the in-flight break up and subsequent ground impact.

Right Propeller [Hartzell HC-E2YL-2BSF, Hub Serial No. BG440]

The right propeller consisted of two pieces, the hub extension with both propeller blades and the cylinder piston with the cone of the spinner still attached. The flange and about 3 inches of the right engine crankshaft were attached to the hub extension.

Blade 1 was mostly intact and bent forward in a shallow c-shape. The training edge of the blade showed gouges and at mid-span. Additional gouges were at the trailing edge of the blade tip.



Figure 19. Right Propeller, Blade 1

Blade 2 was mostly intact and was also bent forward in a shallow c-shape. The trailing edge of the blade showed gouges two-thirds the distance from the hub and at the tip. There were also leading-edge nicks along the first half of the blade.



Figure 20. Right Propeller, Blade 2

The hub extension and flange were intact. A 3-inch section of the left engine crankshaft remained attached to the flange. The crankshaft fracture showed torsional and sideload bending and breaking. The hub extension was disassembled, and the springs examined. The inner and outer springs were intact.

The piston cylinder was broken out at the base ring. The tip of the spinner remained attached to the cylinder. The piston was wedged solidly in the cylinder but still held its air charge of 40 psi. The remaining spinner was torn and broken torsionally and aft.

The two right propeller preload plates showed several witness marks. The marks corresponded with blade angles of 32 to 36 degrees or high-speed cruise.



Photo 21. Right Propeller Preload Plates

Right Propeller Examination Summary

All physical damage to the propeller was consistent with impact damage during the in-flight break up and subsequent ground impact.

G. ADDITIONAL INFORMATION

Oxygen System

The airplane's oxygen bottle was examined. It was intact and broken out from the aft fuselage. Oxygen lines from where the bottle originated, through the cabin walls to the five oxygen ports was traced and showed some line fractures due to ground impact. The oxygen ports, where the oxygen canula/mask lines would be plugged in were clear. The system is activated by a push/pull knob on the lower right side instrument panel. The knob was in, as in the Off position. A thorough examination of the airplane's cabin produced no oxygen masks or cannulas.



Figure 22. Oxygen System Push/Pull Knob

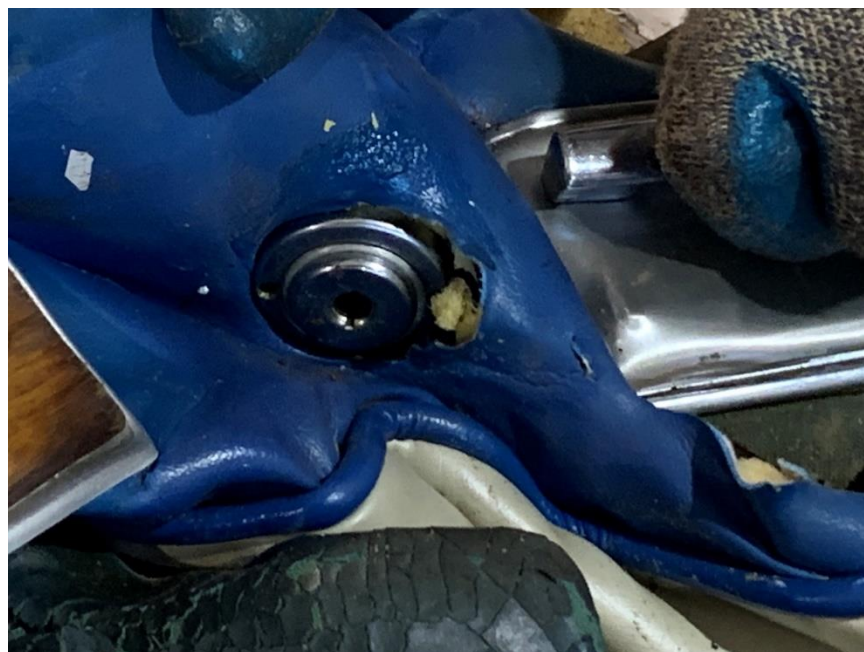


Figure 23. Oxygen System, Pilot's Port



Figure 24. Oxygen System, Supply Bottle

Airplane Flight and Navigation Instruments

The airplane's attitude indicator, turn coordinator, and heading indicator were disassembled and their gyros and gyro cases examined. The two vacuum system driven gyros, the attitude indicator and heading indicator, gyro cases showed rotational scoring at the back and back case walls. The turn coordinator gyro was broken out and pinned inside its crushed case. When removed, it rotated. However, the gyro shaft was bent. The gyro showed no rotational scoring marks.



Figure 25. Attitude Indicator Disassembled



Figure 26. Attitude Indicator Case



Figure 27. Heading Indicator Disassembled

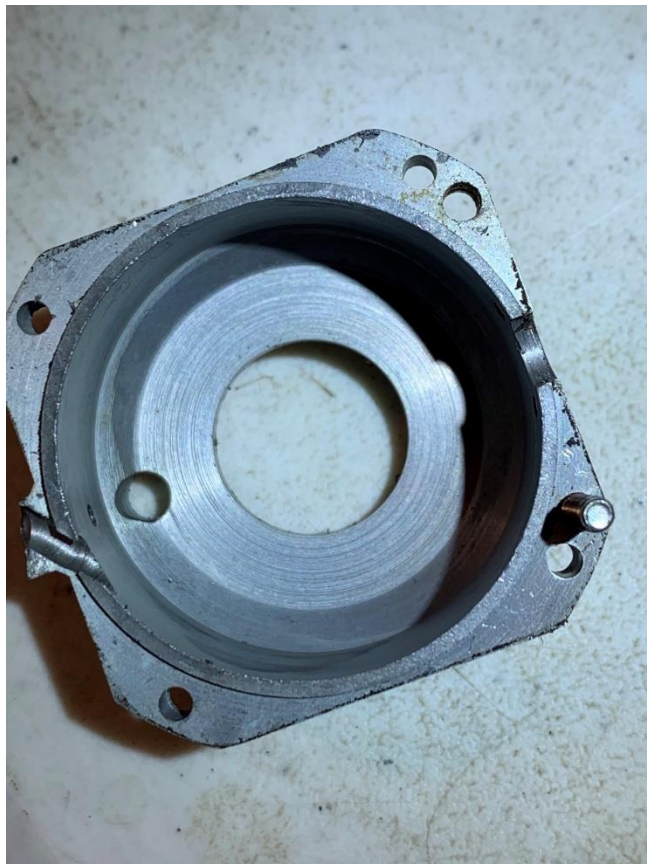


Figure 28. Heading Indicator Case



Figure 29. Turn Coordinator Disassembled

Airplane Heater

The airplane heater was laid out and examined. It consisted of two pieces that were recovered from the field adjacent to the main airplane wreckage at the accident site. The examination of the components showed no preaccident failures or malfunctions that would have precluded normal operation.



Figure 30. Airplane Heater

H. CERTIFICATION AND AGREEMENT

I certify that the notes presented reflect the observations and information made and collected during the time I was at the accident scene of N8357Y. The concurrency of the party members reflect only that these observations are true by the IIC and are open to continued discussion as the investigation continues.



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