



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

June 1, 2022

AIRFRAME AND ENGINE EXAMINATION

WPR22FA164

This document contains 5 embedded photos.

A. ACCIDENT

Location: Cedar City, Utah
Date: April 23, 2022
Aircraft: Diamond Aircraft, DA 40, N321PF
NTSB Investigator-in-Charge: Eric M. Gutierrez

B. PARTICIPANTS

Eric M. Gutierrez
Air Safety Investigator
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Director, Airworthiness and Quality
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C. SUMMARY

Examination of the recovered airframe and engine revealed no anomalies that would have precluded normal operation and the production of power.

D. DETAILS OF THE INVESTIGATION

1.0 Aircraft 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, nose landing gear, main landing gear, instrument panel, cockpit, flight controls, and seats were separated, exhibited thermal and impact damaged throughout. Multiple instruments were separated from the instrument panel and exhibited thermal and impact damaged. The primary flight display (PFD) was heavily impacted and thermally damaged.

Flight control continuity was established from the primary flight controls to the primary flight control surfaces. The cockpit flight controls were separated and exhibited thermal and impact damage throughout. The rudder pedals remained attached to the firewall with heavy impact and thermal damage. All areas of separation were consistent with overload or were cut by recovery personnel.



Figure 1: View of flight control torque tubes.

The left wing from the wing root to about midspan was destroyed fire. A 5 ft left wing outboard section with the aileron attached to the wing attachment points was observed. The left wing flap was separated, thermal and impact damaged was observed throughout. The left main landing gear strut separated from the fuselage and was thermal damaged.

The right wing from the wing root to about midspan was destroyed fire. A section of about 5 ft of the right wing outboard 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 right main landing gear strut separated from the fuselage and was thermal damaged.



Figure 2: View of left- and right-wing tips.

The empennage separated from the fuselage and was thermal damaged throughout. The elevator and trim tab remained attached to the horizontal stabilizer. The elevator push rod tubes were traced to the cockpit, where they were separated from the flight controls. The rudder was thermally damaged throughout. The rudder flight control cables remained attached to their respective mounts.

2.0 Engine Examination

Engine Manufacturer: Lycoming
Engine Model Number: IO-360-M1A
Engine Serial Number: 1-31428-51A

Examination of the recovered engine revealed that the engine remained attached to the engine mounts, impact and thermal damage was observed throughout. All four cylinders remained attached to the engine. The oil sump and intake plenum were mostly destroyed, consistent with impact and thermal damage. No evidence of any mechanical damage was observed to the engine crankcase. The propeller and propeller flange separated from the engine crank shaft. The exhaust remained attached, bending and crushing was observed throughout.



Figure 3: View of recovered engine.

The rocker box covers were removed. The intake and exhaust rocker arms were intact with varying colors on all cylinders, consistent with thermal damage. All intake and exhaust valve springs were in place and visually appeared to be undamaged. All spark plugs were removed, and all four 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 could not be rotated by hand. Utilizing a hand tool, holes were drilled to the top of the engine case and examined internally using a lighted borescope, continuity was established throughout the engine and valve train.

The spark plugs were removed from the engine, and they were the massive electrode type. All sparkplugs exhibited varying degrees of coloration within the electrode area, consistent with thermal effect of post impact ground fire. Additionally, the top and bottom cylinder 2 spark plugs, which had debris within the electrode area. The electrode area remained free of mechanical damage.

The fuel servo was separated, impact and thermal damaged. The throttle lever arm was intact, however would not move, consistent with impact damage. The connecting linkage from the throttle arm to the throttle cable remained attached. The mixture control cable separated at the control rod end, consistent with overload. The mixture control arm remained attached to the fuel servo. The housing to the fuel inlet fuel screen was impact and thermal damaged.

The fuel flow divider was intact and remained attached to the engine. The fuel flow divider disassembled; the diaphragm was thermal damaged. The connecting fuel lines remained

attached to their respective connections. All four fuel injector nozzles were removed from the cylinders, and were found to be free of debris or restrictions

The engine driven fuel pump remained attached to the engine and was impact and thermal damaged. Due to extensive damage, a functional test could not be performed.

The left and right magnetos remained attached to the engine accessory case, extensive damage thermal damaged was observed on both. Due to extensive thermal damage, a functional test could not be performed.



Figure 4: View of left and right magnetos.

The exhaust system remained secure to the cylinders, bending and crushing was observed throughout. Utilizing a lighted borescope, the exhaust system was examined internally, and no anomalies were observed.

Propeller control continuity was established from the firewall to the propeller governor. The governor was separated from the engine and was impact and thermally damaged. The control cables remained attached to the governor, but the control arm separated from the governor.

3.0 Propeller Examination

Propeller Manufacturer: Hartzell
Propeller Serial Number: CH38023B

The airplane was equipped with a two blade Hartzell propeller. The propeller and attached crankshaft flange separated from the engine at the crankshaft. Both blades remained attached to

the propeller hub. Propeller blade A exhibited polishing along the leading edge, along with unidirectional striations on the cambered side of the blade. Additionally, the propeller was fracture separated about near the propeller tip. Propeller blade B exhibited bending forward about mid span, with unidirectional striations on the cambered side of the blade. Additionally, about 5 in of the propeller tip was fracture separated.



Figure 5: View of propeller.

Submitted by: Eric M. Gutierrez