National Transportation Safety Board
Office of Aviation Safety
Washington, DC 20594

CEN23LA107

N304MA – AIRFRAME AND ENGINE EXAMINATION REPORT

April 5, 2023

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A. ACCIDENT

Location: Lakeway, Texas
Date: February 12, 2023
Time: 0958 Local Time
Airplane: N304MA, Mooney M20K

B. N304MA – AIRFRAME AND ENGINE EXAMINATION REPORT

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Party Coordinator	Les Doud, Air Safety Investigator Hartzell Propeller / Hartzell Engine Technologies Piqua, Ohio

C. DETAILS OF THE EXAMINATION

1.0 Airframe Examination (Mooney M20K, Serial Number 25-2004)

- The wreckage was laid out and examined at Air Salvage of Dallas (ASOD) in Lancaster, Texas. The wreckage examination was held on April 4, 2023, and April 5, 2023. The investigative team was assisted by various staff from ASOD.
- The airplane sustained substantial damage to both wings.
- There was no fire.
- The wings were cut near the root to facilitate the recovery from the accident site.
- The airframe data plate was located and documented.
- Flight control continuity was established.
- There were no signs of the flight controls being jammed or being interfered with.
- All impact signatures observed were consistent with overstress.
- The fuel selector was found between the “left” and the “right” position. The fuel selector could be moved by hand with no issues noted.
- Both wing fuel tanks were breached from the impact sequence.
- The wing tank finger screens were found to be free from debris.
- No fuel samples were obtained from the airframe.
- The cockpit was intact, and it was documented.
- The Hobbs meter, located in the baggage compartment, was documented.

- The wing tank fuel caps were intact, found installed, and appeared to provide the correct seal for the port.
- An engine monitor and a fuel flow monitor were removed from the cockpit and were submitted to the NTSB Vehicle Recorders Laboratory. The fuel flow transducer was also removed from the engine and was shipped with the fuel flow monitor.
- The pilot's three-point restraint system was intact, with no damage, and an operations check was performed with no issues noted.
- There were no large bags or cases found in the wreckage.
- The retractable tricycle landing gear was found intact.
- No signs of preimpact mechanical malfunction or failure were noted with the airframe.

2.0 Engine Examination (Continental Motors TSIO-360-SB, Serial Number 317271)

- Airframe to engine control continuity was established.
- There was no fire.
- The engine data plate was found and documented.
- The engine and engine accessories were found intact.
- The engine case appeared to be intact.
- The left cooling air/exhaust tunnel where the engine breather/drain tubes exited was wet with oil. The right tunnel where engine exhaust exited was dry and looked normal.
- All 12 spark plugs were removed and examined, per the Champion Aerospace Aviation-Check-A-Plug chart. Both top and bottom plugs from Cylinder #6 were found wet with oil.

  Top:
  1: Electrode appears to be worn-normal, black within the plug, appears carbon fouled.
  3: Electrode area appears to be worn out - normal, black within the plug, appears carbon fouled.
  5: Electrode area appears to be worn out - normal, black within the plug, appears carbon fouled.
  2: Electrode area appears normal, black within the plug, appears carbon fouled.
  4: Electrode area appears to be worn - normal, black within the plug, appears carbon fouled.

6: Electrode area appears to be worn out – normal, oil / black within the plug, appears to be oil fouled or carbon fouled with oil leaking past the rings after the accident.

Bottom:
1: Electrode appears to be worn-normal, black within the plug, appears carbon fouled.
3: Electrode area appears to be worn out - normal, black within the plug, appears carbon fouled.
5: Electrode area appears to be worn out - normal, black within the plug, appears carbon fouled.
2: Electrode appears to be worn-normal, black within the plug, appears carbon fouled.
4: Electrode appears to be worn-normal, black within the plug, appears carbon fouled.
6: Electrode area is undetermined, oil / black within the plug, appears to be oil fouled or carbon fouled with oil leaking past the rings after the accident.

- The engine was rotated via the propeller by hand with no issues noted. During the rotation, the impulse coupler was heard.
- Thumb compression was obtained for all cylinders, except for cylinders #1 and #6.
- There was no piston movement noted in the #1 cylinder when viewed through the top spark plug hole. There was also no valve movement. The #1 cylinder was attempted to be removed, but due to the damage sustained, it could not be removed.
- Intake and exhaust valve rocker arm movement appeared to move in the correct firing order when rotation occurred for the remaining cylinders.
- The #6, the #4, and the #2 cylinders were all removed and examined. The #1 connecting rod had detached from the crankshaft and the crankpin displayed signatures of excessive heat damage. The connecting rod cap was seen in the piston barrel. Internal damage was noted to the #1 cylinder base/skirt area. The #6 cylinder combustion chamber/valve area was wet with oil and had some peening marks.
- The #6 piston had a portion of the crown missing and a hole was visible from the top of the piston, extending behind the rings and through the piston skirt. The #6 piston also had some peening marks on the crown. The #4 and the #2 pistons had excessive ring gap clearance.
- The #6, #4, and #2 cylinders and pistons were shipped into the NTSB Materials Laboratory for further examination work. The engine maintenance records were also shipped with engine components.
- All 6 injection nozzles were removed, examined, and were free from debris.

- The flow divider was disassembled, and no issues were noted.
- The two magnetos were found attached and undamaged. All leads produced spark with the propeller was rotated by hand. The right magneto was found at 22 degrees. It is supposed to be at 20 degrees. The left magneto was found at 15 degrees. It is supposed to be at 20 degrees.
- The ignition harnesses were found intact.
- The alternator and starter were found intact and were attached to the engine.
- The engine fuel and oil lines all appeared to be intact and did not appear to be loose or disconnected. All b-nuts appeared to be tightened.
- The oil sump appeared intact.
- The oil filter was found removed from the engine. It was cut open and the filter material was examined. A small number of debris was found in the filter material.
- No fuel samples were obtained from the engine.
- The oil breather tube was found intact, and the slot was not blocked. Engine oil was splattered in and around the oil breather tube area, including traveling rearward on the area underneath the oil breather tube.
- The oil level was checked via the dipstick and a teardrop amount of oil was noticed on the dipstick.
- The oil filler cap was found intact.
- The exhaust tubing and induction system was found intact.
- The entire turbocharger system was examined, and no issues were noted. Refer to the Hartzell Propeller field notes for additional information about the turbocharger system.
- The areas of concern found during the engine examination was the hole in the #6 piston head, both magneto timing values, and several spark plugs in a worn out condition.

3.0 Propeller Examination (Hartzell Propeller, PHC-J3YF-1RF/F7663AK-2R, Serial Number FP1240B)

- Refer to the Hartzell Propeller field notes for additional information about the propeller.
- No signs of preimpact mechanical malfunction or failure were noted with the propeller.

4.0 Maintenance Records Review

- The historical FAA registration and airworthiness records were obtained from the FAA website.
- The maintenance records (airframe, engine, and propeller) were examined and documented.

Submitted by:

Michael J. Hodges
Investigator-In-Charge