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

WPR21FA272

RECOVERED ENGINE EXAMINATION

October 5, 2021

A. ACCIDENT

Location: Dinsmore, California
Date: July 15, 2021
Time: 1150 Pacific daylight time
Airplane: N4474H, Mooney M20J

B. RECOVERED ENGINE EXAMINATION

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Party Coordinator	Mark Platt Lycoming Engines Williamsport, PA

C. DETAILS OF THE EXAMINATION

1.0 Engine Examination

Examination of the recovered engine revealed that it remained attached to the airframe by the engine mount. The engine had sustained thermal and impact damage.

The top spark plugs and rocker box covers were removed. The vacuum pump was removed and the crankshaft was rotated by hand through the drive pad utilizing a drive tool. The crankshaft was free and easy to rotate in both directions. "Thumb" compression was observed in proper order on all four cylinders.

The complete valve train remained intact and was observed to operate in proper order. Further examination found that the intake valve rockers of each cylinder were moving approximately 40% less when compared to the exhaust rockers. Oil was observed at all four rocker box areas.

Mechanical continuity was established throughout the rotating group, valve train and accessory section during hand rotation of the crankshaft.

The engine was completely disassembled.

The cylinders combustion chambers and barrels remained mechanically undamaged and there was no evidence of foreign object ingestion or detonation. The valves were intact and undamaged. There was no evidence of valve to piston face contact observed. The pistons were intact. The ring assemblies on each piston (except #4)

were intact and free to rotate within their respective ring land. The second ring on piston number four was partially stuck in the ring land.

The gas path and combustion signatures observed at the spark plugs, combustion chambers and exhaust system components displayed coloration consistent with normal operation. There was no oil residue observed in the exhaust system gas path.

Mechanical continuity of the rotating group and internal mechanisms were established visually during the disassembly and examination of the engine. The accessory gears including the crankshaft gear, bolt and dowel were intact and remained undamaged.

The crankshaft and attached connecting rods remained free of heat distress. The main bearings exhibited signs of significant wear. The main bearing saddles at each crankcase exhibited significant fretting signatures.

The camshaft was intact. Each of the exhaust camlobes exhibited their characteristic elliptical shape and the corresponding tappet face remained undamaged and smooth.

The intake camlobes exhibited a severely worn and rounded shape. The corresponding tappet was severely galled.

The single drive dual magneto was found securely clamped at the mounting pad. Magneto to engine timing could not be obtained. The impulse coupler drive was found intact and secure. The drive functioned normally during hand rotation of the drive. The magneto produced spark at the eight leads during hand rotation of the drive shaft.

The spark plugs were secure at each position with their respective spark plug lead attached. The top spark plugs were removed and remained mechanically undamaged, and according to the Champion Spark Plugs Check-A-Plug chart AV-27, the spark plug electrodes displayed coloration consistent with normal operation

The ignition harness was attached at the respective magnetos and each spark plug. The ignition harness had been subjected to post mishap ground fire and had sustained thermal damage.

The fuel injection servo remained securely attached at the mounting pad of the plenum. The throttle/mixture controls were found securely attached at their respective control arm of the servo. The castellated nut and cotter pin remained secure and the serrated interface at the throttle and mixture arm remained securely mated. The plug on the side of the injector body was secure with the safety wire in

place. The fire damaged fuel injection servo and induction system were examined and observed to be free of obstruction.

The fuel flow divider remained secure at the mounting bracket situated at the top of the engine. The fuel lines remained secure at each flow divider fitting and fuel injector at each cylinder. The flow divider was disassembled. The diaphragm was destroyed due to the thermal effects of the post impact ground fire.

The fuel injection nozzles remained secure at each cylinder with the respective fuel line attached. The nozzles were removed and examined. The nozzles remained free of visible contamination or obstruction to flow.

The fuel pump was displaced from the engine. The portion of mounting flange remained secure at the mounting pad. The fracture surfaces exhibited signatures consistent with overload.

The oil suction screen was found secure and uncontaminated by any pre-mishap debris.

Submitted by:

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Aviation Accident Investigator