



Memorandum For Record

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Following recovery of the wreckage, examination of both engines was performed on September 16 and 17, 2020 by a representative of the engine manufacturer with oversight from the Federal Aviation Administration. The examination was conducted at Florida Air Recovery & Storage facility in Fort Pierce, Florida. The following factual observations were noted:

Examination of the left engine which was separated from the airframe revealed the propeller remained attached to the engine crankshaft flange. Visual examination revealed that both crankcase halves were fractured in multiple locations. Cylinders Nos. 1, 2, 4, and 6 exhibited impact damage. The exhaust and intake tubing were impact damaged and partially separated. The fuel injector servo, hydraulic pump, both magnetos, oil filter, vacuum pump, alternator and starter were impact separated from the engine. The fuel flow divider and fuel injector lines were partially separated from the engine. The engine crankshaft could not be rotated by turning the propeller. The propeller and cylinders Nos. 2, 4, and 6 were removed. Portions of the Nos. 2 and 4 crankcase cylinder mount pads were cut away to facilitate the removal of the No. 2 piston pin. Continuity of the crankshaft, camshaft and connecting rods was confirmed by visual examination. No damage other than impact damage was noted to the cylinders, valves, valve rockers, pushrods, pistons or piston pins. The interiors of the Nos. 1, 3 and 5 cylinders were viewed using a lighted borescope and no anomalies noted.

Examination of the left engine fuel system components revealed the servo fuel injector (fuel servo) was impact damaged and separated from the engine. The throttle and mixture control cable rod ends remained attached to the servo throttle and mixture control arms, but the throttle and mixture control cables were separated from the rod ends. The regulator section of the fuel servo was partially disassembled and no damage was noted to the rubber diaphragms of other internal parts noted. About 1 teaspoon of blue liquid with an odor consistent with aviation gasoline was observed behind the fuel diaphragm. A few drops of liquid were observed behind the air diaphragm. The fuel inlet screen was absent of debris. The fuel flow divider was impact damaged and separated from the engine. The metal fuel injector nozzle lines were separated from

the flow divider. The flow divider was partially disassembled. No internal damage was noted and no debris was observed. The flow divider fuel screen was absent of debris. The Nos. 3, 4 and 6 fuel injector nozzles were impact destroyed. The Nos. 1, 2, 5 and 6 nozzles were unobstructed. The engine driven fuel pump remained attached to the engine. One of the fuel fitting, along with its hose was impact separated. The pump could not be rotated by hand. The pump was partially disassembled and no damage to the internal pumping vanes noted.

Both magnetos were impact separated from the engine and their positions (left or right) on the accessory case undetermined. Both magnetos produced spark from all 6 ignition towers when rotated by hand. The spark plug electrodes exhibited dark gray coloration and worn normal condition. The No. 5 top and the Nos. 1, 2, 5 and 6 bottom spark plugs were impact damaged. The intact spark plug electrodes remained mechanically undamaged, and according to the Champion Spark Aviation Check-A-Plug chart AV-27, the spark plug electrodes displayed coloration consistent with normal operation. The engine ignition harness was impact damaged.

Oil was observed in the engine. No debris was observed on the oil suction screen or the oil filter media.

Examination of the right engine which was separated from the airframe revealed the propeller remained attached to the engine crankshaft flange. Visual examination revealed that both crankcase halves were fractured in multiple locations. Cylinders Nos. 2 and 5 exhibited impact damage. The exhaust and intake tubing were impact damaged and partially separated. The fuel injector servo, both magnetos, oil filter, and alternator were impact separated from the engine. The fuel flow divider and fuel injector lines were partially separated from the engine. The engine crankshaft could not be rotated by turning the propeller. The propeller and cylinders Nos. 2, 4, and 6 were removed. Continuity of the crankshaft, camshaft and connecting rods was confirmed by visual examination. No damage other than impact damage was noted to the cylinders, valves, valve rockers, pushrods, pistons or piston pins. The interiors of the Nos. 1, 3, and 5 cylinders were viewed using a lighted borescope and no anomalies noted.

The fuel servo was impact damaged and separated from the engine. The throttle control cable was impact separated from the engine. The mixture control cable remained attached to the servo. The regulator section of the fuel servo was partially disassembled and no damage to the rubber diaphragms or other internal parts noted. About 1 teaspoon of blue liquid with an odor consistent with aviation gasoline was observed behind the fuel diaphragm. Red colored liquid was found behind the air side diaphragm, the fluid was collected and retained by the NTSB. The servo fuel inlet screen was absent of debris. The fuel flow divider was impact damaged and separated from the engine. All but one of the metal fuel injector lines were attached to the flow divider. The flow divider was partially disassembled. No internal damage was noted and no debris was observed. The flow divider fuel screen was absent of debris. No fuel was found in the divider. Portions of the fuel nozzles from cylinders Nos. 1, 3, 4, and 6 remained in the cylinder heads and were unobstructed when removed and examined. Nozzles from cylinders Nos. 2 and 5 were impact separated from the engine. The engine driven fuel pump was impact separated from the engine. The inlet fuel line remained attached to the pump with no obstructions in the line noted, and the outlet line was impact separated from the pump. The outlet line fitting remained attached to the

pump. The drive gear for the pump was impact destroyed and the pump could not be rotated by hand. The pump was partially disassembled and no damage to the internal pumping vanes noted.

Both magnetos were impact separated from the engine and their positions (left or right) on the accessory case undetermined. Both magnetos produced spark from all 6 ignition towers when rotated by hand. The bottom spark plugs on cylinders Nos. 2 and 5 exhibited impact damage on the harness side of the plugs. The intact spark plug electrodes remained mechanically undamaged, and according to the Champion Spark Aviation Check-A-Plug chart AV-27, the spark plug electrodes displayed coloration consistent with normal operation. The engine ignition harness was impact damaged.

The oil filter adapter and the oil filter were impact separated from the engine. The oil filter canister exhibited impact damage. No debris was observed on the oil suction screen or the oil filter media.