



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

February 22, 2017

AIRFRAME AND ENGINE EXAMINATION SUMMARY

WPR17FA063

This document contains 11 embedded photos.

A. ACCIDENT

Location:	Ramona, California
Date:	02/12/2017
Aircraft:	N2179L; Cessna 172S
NTSB Investigator-in-Charge:	Andrew Swick

B. PARTICIPANTS

Andrew Swick-NTSB IIC
John Mathieu-FAA
Peter Basile-Textron Aviation
Chris Lang-Continental Motors Inc.

C. SUMMARY

On February 12, 2017 about 1410 Pacific standard time, a Cessna 172S, N2179L, impacted terrain while maneuvering five miles north of Ramona, California. The certified flight instructor (CFI) and student pilot had minor injuries and the rear seated passenger was fatally injured. The airplane sustained substantial damage. The aircraft was registered to and operated by American Aviation Academy, Inc, Gillespie, California, under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed and no flight plan was filed for the local instructional flight. The flight originated from Gillespie Field Airport (SEE), Gillespie, California at about 1400.

The student pilot stated that he completed a weight and balance calculation, which was signed off by the CFI. After the preflight was accomplished and fuel was added to the airplane, an additional passenger boarded. After approaching the practice area and conducting training near a dirt strip, two consecutive simulated engine failure procedures were accomplished. While climbing out on the last simulated engine failure, the CFI instructed the student pilot to turn left in the direction of east. While in the turn with full power, the student pilot recognized rising terrain and the CFI took over control of the airplane. Subsequently, the airplane impacted a wooded valley about 5 miles north of Ramona, California.

Examination of the accident site by a Federal Aviation Administration (FAA) inspector, revealed that the airplane impacted a large tree and steep terrain. The tree penetrated through the main cabin floor and roof. The main wreckage remained intact with the exception of the propeller assembly which was located near the main wreckage. The wreckage was relocated to a secure facility for further examination.

D. DETAILS OF THE INVESTIGATION



Figure 1-Main Wreckage

1.0 Airframe Examination

Examination of the recovered airframe revealed that a limb from a large tree protruded through the cabin floor continuing up through the cabin roof. The limb at the cabin floor was about 12 inches in diameter and about eight inches in diameter near the roof. The lower section of the limb located near the floor had several control cables protruding upwards over the limb, two of the cables revealed tension overload signatures. The limb was cut by recovery personnel about a foot below the fuselage and above the cabin roof. The tree section could not be removed from the wreckage. The fuselage was buckled in several areas. The engine, and the upper section of the firewall was pushed aft, resulting in the deformation of the instrument panel. The propeller assembly and attached crankshaft propeller flange separated from the engine. The cabin seats remained attached and undamaged. The right forward seat inboard aft section of the seat rail separated. Both entry doors separated from the wreckage. The wings had impact damage and were removed during the recovery process.



Figure 2-Main Wreckage

Control cable continuity was established through tension overload signatures on both elevator and right rudder control cables. Control cable continuity was also found forward of the limb location in the cabin.



Figure 3-Cabin Area



Figure 4-Wings

The wings were removed by recovery personnel. Both wing outboard sections had leading edge crushing and the fiberglass tips separated. The right wing lower leading edge section from the midsection of to the tip was crushed upwards. Per the flap jack screw, the flap position was found to be in the up position. The fuel caps on both wings had a missing vent seal. The right wing fuel cap was not attached to its lanyard, which was located and attached to the wing. The wings upper and lower surfaces were buckled. The wing struts were cut and separated during recovery efforts.



Figure 5-Fuel Strainer

About 2 ounces of fuel was drained from the fuel reservoir tank and was clear of debris. About 10 ounces of fuel was drained from the fuel strainer which exhibited light colored debris. The fuel strainer was disassembled and displayed on an examination table. An RTV type sealant was found on and near the attachment screw. The screen was clear of debris and the bowl had light sediment near the bottom. Black greasy fingerprints were found on the screen and a down tube.

The fuel selector valve was found in the both position. The throttle, mixture and fuel shutoff control knobs were found to be in the cutoff or out positions. The knob control cables and their attachment brackets behind the console had impact damage and the knobs moved little with effort.

2.0 Engine Examination



Figure 6-Airframe and Engine

The following description of the engine examination was prepared by the Lycoming investigator.

The Lycoming IO-360-L2A engine remained attached to the airframe by the engine mount. The engine had sustained moderate impact energy damage at the exhaust system and engine mount. The propeller and attached crankshaft flange had been displaced. Visual examination of the engine revealed no evidence of pre-impact catastrophic mechanical malfunction or fire.



Figure 7-Engine Examination, Forward Side

The top spark plugs were removed, examined and photographed. 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 was observed to operate in proper order, and appeared to be free of any pre-mishap mechanical malfunction. Normal "lift action" was observed at each rocker assembly. Clean, uncontaminated oil was observed at all four rockerbox areas. Mechanical continuity was established throughout the rotating group, valve train and accessory section during hand rotation of the crankshaft. The bottom spark plugs were removed, examined and photographed. The combustion chamber of each cylinder was examined through the spark plug holes utilizing a lighted borescope. The combustion chambers 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 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. There was significant ductile bending of the exhaust system components.



Figure 8-Engine Aft Side

The left and right magnetos remained securely clamped at their respective mounting pads. The ignition harness was secure at each magneto. Magneto to engine timing could not be ascertained, due to the displacement of the flywheel. The magnetos were removed for examination. Each magneto produced spark at the end of the respective spark plug lead, during hand rotation of the drive. The drives of each magneto remained intact and undamaged. The "P" lead at each magneto was secure at the electrical post. There was no evidence of pre-impact mechanical malfunctions observed during the examination of the engine.

The spark plugs were secure at each position with their respective spark plug lead attached. The spark plugs were removed, examined and photographed. The spark plug electrodes 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 static oil soaking of the spark plugs (as noted) was attributed to the engine positioning at the mishap site and post recovery.



Figure 9-Propeller Assembly

The propeller assembly and the attached crankshaft propeller flange separated from the engine during the accident sequence. The crankshaft fracture surface exhibited signatures consistent with torsional overload due to the absorption of rotational energy. One blade was bent slightly aft and had light striations.



Figure 10-Examination Table-Engine Components

The fuel injection servo remained securely attached at the mounting pad of the plenum. The hex nut at the left rear stud was missing. The servo mounting flange had been displaced and cracked as a result of impact forces. The throttle/mixture controls were found securely attached at their respective control arm of the servo. The plug on the side of the injector body was secure with the safety wire in place. The servo fuel inlet screen fitting had been displaced from impact forces and was found free of contamination. The fuel injection servo and induction system were examined and observed to be free of obstruction.

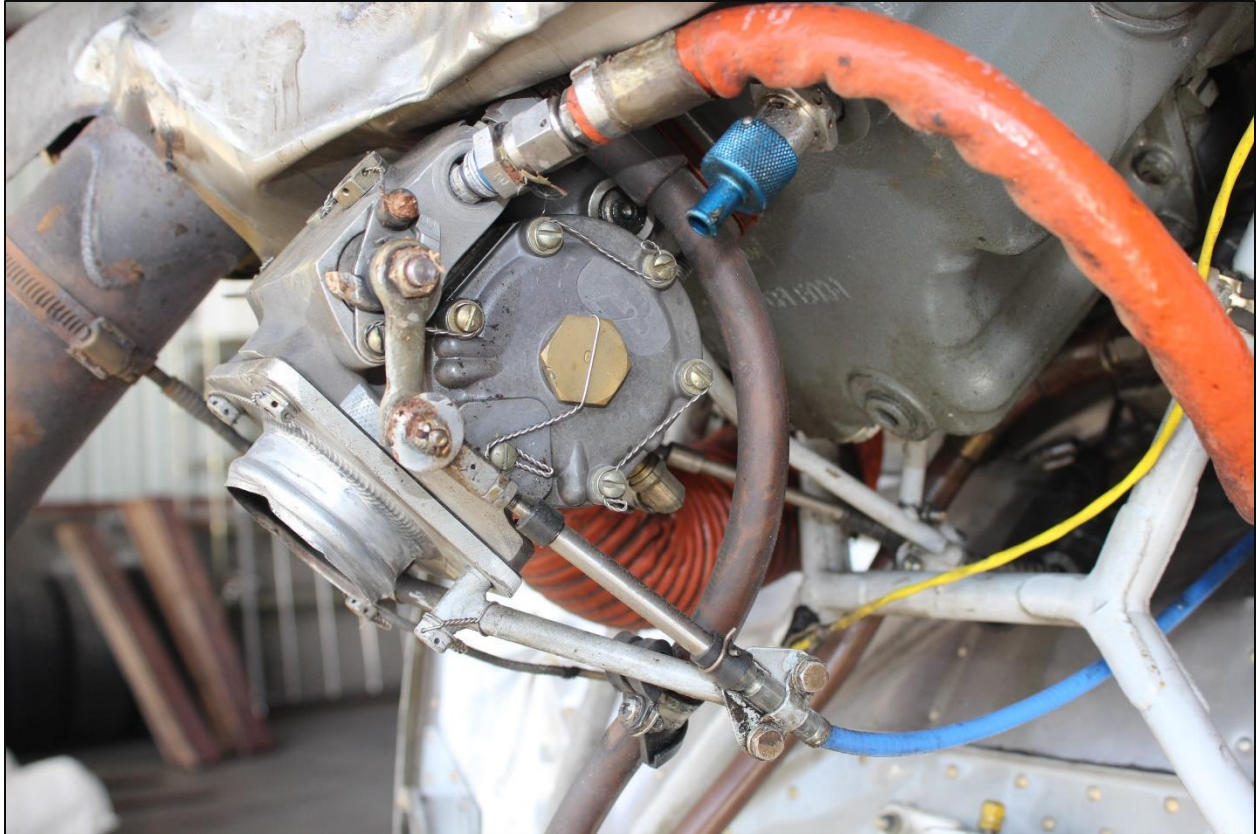


Figure 11-Fuel Servo

All engine compartment fuel lines were found to be in place and secure at their respective fitting of each fuel system component with the exception of the inlet fuel line to the fuel servo, where there is evidence of impact damage to the fitting. Fluid consistent with the appearance and odor of aviation fuel was found at key locations about the engine during the removal of various fuel system components.

The fuel flow divider (aka: spider) 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. There was no evidence of internal mechanical malfunction or obstruction to fuel flow. The diaphragm remained intact and undamaged.

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 attached to the engine at the mounting pad. There was no safety wire found on the attachment bolts. The fuel lines remained secure at their respective fittings. The fuel pump was removed for examination. The fuel pump remained free of internal mechanical malfunction and obstruction to flow.

The engine drive fuel pump top two castellated nuts were not safety wired. The fuel servo aft stud was missing nut; no fuel leak was detected.

Submitted by: Andrew Swick