



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

12/12/2019

ENGINE EXAMINATION SUMMARY

WPR19FA175

This document contains 6 embedded photos.

A. ACCIDENT

Location:	Santa Catalina Island, CA
Date:	June 17, 2019
Aircraft:	Robinson R-44, N7187D
NTSB Investigator-in-Charge:	Maja Smith

B. SUMMARY

Examination of the recovered engine was conducted at the facilities of Air Transport, Phoenix, Arizona, on August 8, 2019.

C. DETAILS OF THE INVESTIGATION



Figure 1. Engine

The engine separated from the airframe upon impact and it sustained significant thermal energy damage. Visual examination of the engine revealed no evidence of pre-impact catastrophic mechanical malfunction or fire.



Figure 2. Spark plugs

The top spark plugs were removed and visually inspected. The top spark plugs electrodes remained mechanically undamaged, and displayed varying coloration attributed to thermal effects of the post impact ground fire.

Crankshaft rotation was attempted by hand utilizing the cooling fan; however, rotation of the crankshaft was precluded due to impact and thermal damage to the engine.



Figure 3. #1,#3 and #5 intake and exhaust valve



Figure 4. #2, #4 and #6 intake and exhaust valve

The rocker covers were removed. The complete valve train within the rocker box areas appeared to be free of any pre-mishap mechanical malfunction. The combustion chamber of each cylinder was examined through the spark plug holes utilizing a lighted borescope. The combustion chambers and bottom spark plug electrodes remained mechanically undamaged, and there was no evidence of foreign object ingestion. The valves were intact and undamaged. There was no evidence of valve to piston face contact observed. There was no oil residue observed in the exhaust system gas path. There was significant ductile bending of the exhaust system components.

The various fuel supply lines at the engine and firewall were subjected to the forces of impact energy and had become displaced at their respective fittings when the engine separated from the airframe, thus compromising the fuel system. There was no fuel observed.

The ignition harness had been subjected to post mishap ground fire and had sustained thermal damage. The harness appeared to have been attached at each spark plug lead.

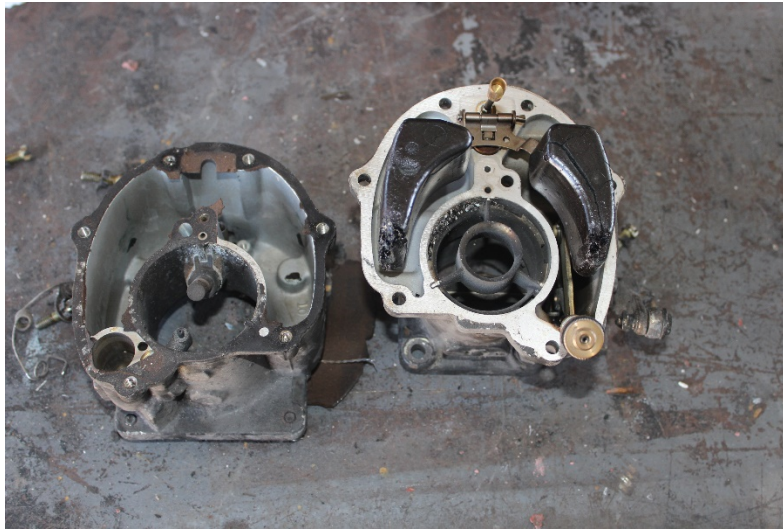


Figure 5. Carburetor

The carburetor was displaced from the engine at the mechanical attachments that secured it to the engine. The fracture surface signatures were consistent with overload. The throttle control rod-end was found securely attached at the control arm of the carburetor. The mixture cable had been pulled from the end of the arm. Both the throttle and mixture controls had been moved beyond the normal operating range (pulled) during the accident. A reliable setting at the time of impact could not be determined. The castellated nut and cotter pin remained secure and the serrated interface at the throttle arm remained securely mated. The carburetor was opened for examination. The fuel bowl remained free of visible pre-impact contaminants. The float assembly remained secure at the mounting and free of damage. The heat damaged float pontoons exhibited no evidence of rubbing against the wall of the bowl. All internal locking tabs and safety devices of the carburetor were in place and properly secured. The fuel inlet screen was found properly installed and free of contamination. No external fuel staining was observed.

To facilitate further internal examination, holes were drilled through the top of the engine case material in-line with the rotational plane of each connecting rod. A lighted borescope was inserted to visualize each connecting rod, crankshaft and camlobes at the respective cylinder position. There was no evidence of lubrication deprivation or contamination found. The crankshaft and attached connecting rods remained free of heat distress. There were no signatures or conditions observed consistent with any pre-mishap catastrophic mechanical malfunction. The camshaft was intact and each of the camlobes exhibited their characteristic elliptical shape.

The accessory case was removed. The accessory gears remained intact. The crankshaft gear and bolt were unseated. The dowel pin was sheared.

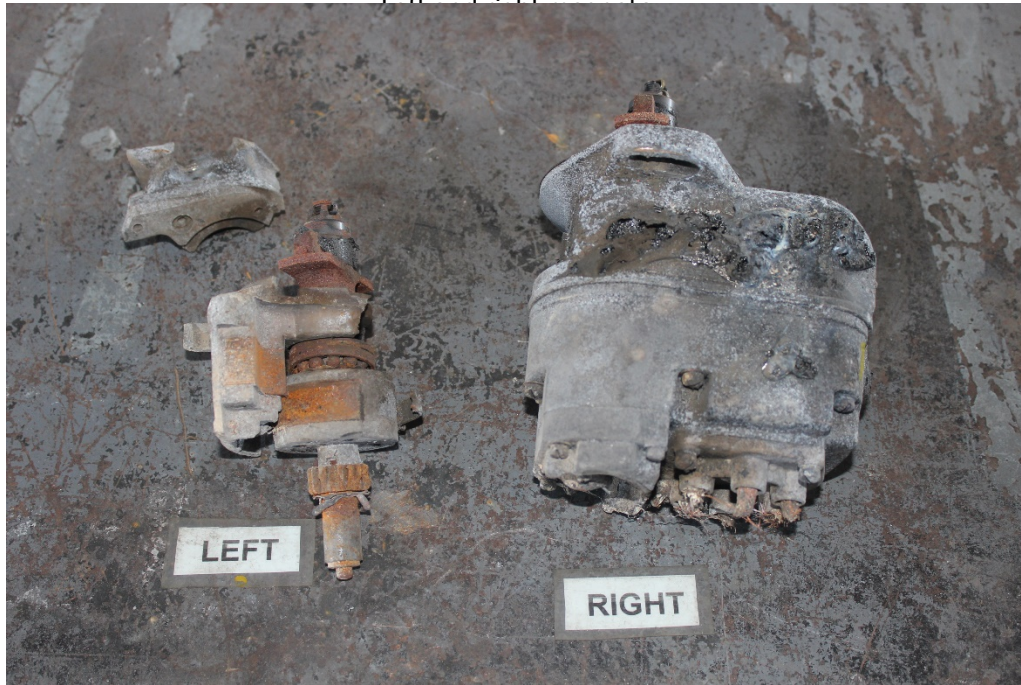


Figure 6. Left and right magneto

The left magneto had sustained impact and thermal energy damage. The pieces of magneto flange that remained at the mounting pad were securely clamped. Magneto to engine timing could not be ascertained. The drive was found intact and secure. The magneto sustained varying degrees of damage that rendered the unit inoperative and therefore, could not be functionally tested.

The right magneto was found securely clamped at the mounting pad. The magneto had been subjected to thermal effect as a result of the post impact ground fire. The magneto sustained varying degrees of damage that rendered the unit inoperative and therefore, could not be functionally tested. Magneto to engine timing could not be ascertained. The drive was found intact and secure.