



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

December 15, 2021

AIRFRAME AND ENGINE EXAMINATION SUMMARY

WPR20LA035

This document contains 6 embedded images.

A. ACCIDENT

Location:	Laveen Village, Arizona
Date:	November 15, 2021
Aircraft:	N535D; Sonex
NTSB Investigator-in-Charge:	Andrew Swick
FAA Inspector-in-Charge:	Dale Sykes

On November 15, 2021, about 1130 mountain standard time, an experimental amateur-built Sonex WAIEX-B airplane, N535D, was substantially damaged when it was involved in an accident near Laveen Village, Arizona. The pilot was not injured. The airplane was operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that he had been flying for about 48 minutes when the engine began to run rough. He said the airplane did not have enough power to maintain altitude and he initiated a forced landing to an airstrip. The pilot realized he was not going to make the airstrip and landed on desert terrain, impacting rocks and a barbed wire fence which caused the airplane to nose over. The pilot was able to exit the cabin area through the broken canopy.

The airplane's wings, and fuselage sustained substantial damage. The airplane was equipped with an engine monitoring system and recorded engine data was downloaded for the investigation.

The airplane was relocated to a secure facility for further examination.

B. EXAMINATION SUMMARY

Examination of the airframe revealed no evidence of preexisting malfunctions or failures that would have precluded normal operation. The engine was examined, and the No. 4 exhaust valve rocker swivel pad and swivel housing separated from its adjustment screw and rocker. The No. 4 exhaust push rod was not secured in the rocker socket end. The No. 4 exhaust valve would not actuate during the crankshaft rotation.

DETAILS OF THE EXAMINATION

1.0 Airframe Examination



Figure 1-Main wreckage layout.

The wings were disassembled and removed from the airframe during the wreckage recovery from the accident site. The wings had impact damage at the tips and buckling throughout their surface. The canopy structure was crushed, and the canopy glass had separated. The flight control tubes to the wings were cut during the recovery. The empennage and the tail flight controls (Y-tail), were undamaged and moved freely by hand. Flight control continuity was established.

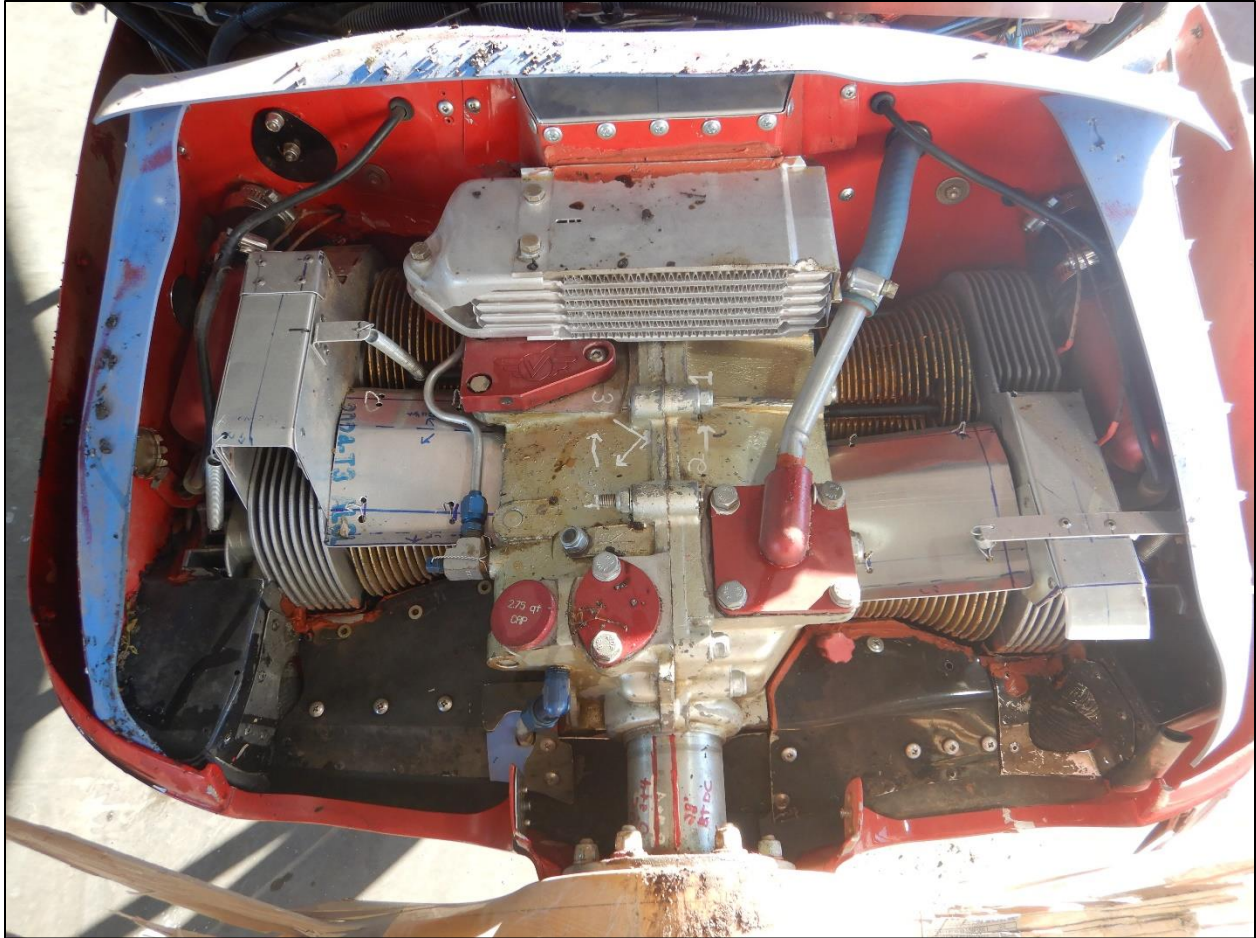


Figure 2-Engine assembly.

The upper and lower engine cowlings were removed from the engine. The upper and lower cowlings had oil and dirt debris on their right-hand inside surfaces. The engine exterior was examined and no anomalies were noted. Oil was leaking from the right set of cylinders, (Cylinder No. 3 and 4) from the rocker cover mating surface area.

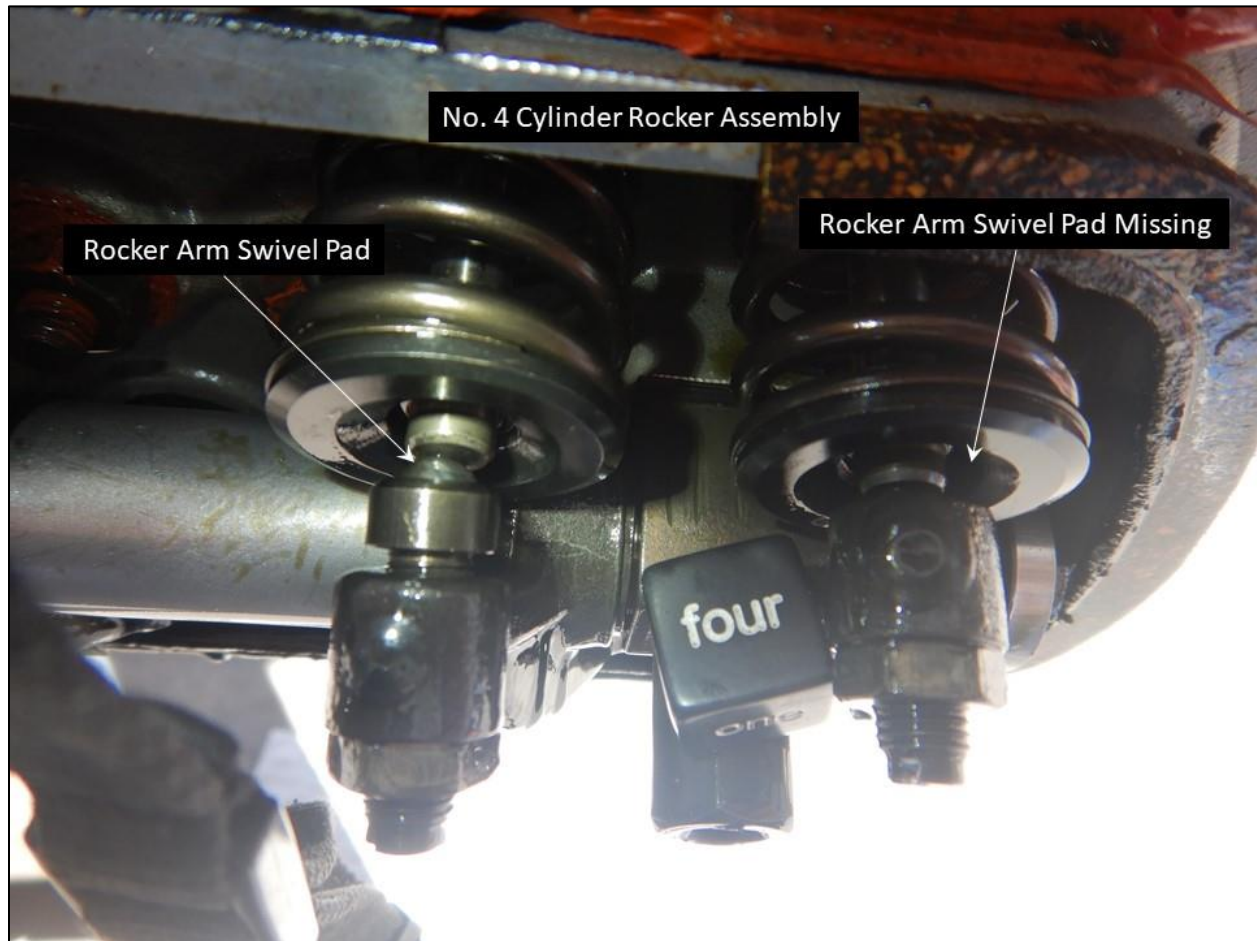


Figure 3-No. 4 cylinder rocker assembly.

The rocker covers were removed and the right rocker cover gasket separated into two sections. The valve rocker assemblies, on both sets of cylinders were covered in a residue of oil and were secure.

The lower spark plugs were removed from the cylinders. The No. 1, 3 and 4 spark plugs had a normal amount of combustion deposits and the electrodes had (Normal-Worn Out) wear conditions when compared to a Champion Aviation Check-A-Plug chart. The No. 2 spark plug electrode area was covered with a dark sooty residue. The crankshaft was rotated by hand and cylinder thumb compression was attained. During the rotation of the crankshaft, valve movement was consistent with all valve spring assemblies except for the No. 4 cylinder exhaust valve spring assembly. The exhaust valve push rod was not engaged in the valve rocker. The pushrod moved consistently with other rocker assemblies when pushed in [riding on the camshaft]. The rocker swivel pads contact on all valve stems, except for No. 4 cylinder exhaust valve, were

positioned off center of each contact surface area for proper rotation during operation. Each swivel pad had complete and correct contact with the valve stem during crankshaft rotation.



Figure 4-Rocker valve swivel pad and housing (valve side view).



Figure 5-Rocker valve swivel pad and housing (separated section view)

The No. 4 cylinder exhaust valve rocker arm swivel housing and swivel pad separated from its screw body. The screw body was remained secured to the rocker arm (see figure 6). The swivel pad and swivel housing was found loose in the rocker cover. The swivel pad remained loose in the swivel housing and impact damage was visible on the swivel housing. Impact damage on the swivel housing, on the separation surface side, had two impact marks consistent with impact from the circular swivel housing screw side. The No. 4 rocker arm's oil galley's were free of obstruction.



Figure 6-Rocker and swivel adjustment screw section.

The cylinders combustion chambers were examined with the use of a lighted boroscope. The combustion chambers including the valve heads were undamaged and had a layer of combustion deposits that were consistent with normal operation.

Submitted by: Andrew Swick