

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR22FA331

ENGINE EXAMINATION

August 12, 2024

A. ACCIDENT

Location: Shafter, California
Date: September 2, 2022
Time: 1100 Pacific daylight time
Airplane: N5943, Yakovlev Yak-11

B. SUMMARY

The engine was examined and partially disassembled at the facility of Anderson Aeromotive Inc., Grangeville, Idaho, on August 7, 8, and 9, 2024.

C. DETAILS OF THE EXAMINATION

1.0 Engine Examination

Examination of the engine revealed that the engine was separated into 2 sections, between the main case and the collector case. The collector case was impact damaged. A separated section remained attached to the main case.



Figure 1: Forward section of the engine.



Figure 2: Collector case, intermediate rear case, and rear case assemblies.

Internal examination of the collector case, intermediate rear case, and rear case sections revealed no evidence of any thermal discoloration. A slight amount of metallic debris was observed in the internal areas of the collector case and intermediate rear case sections.

The induction system and exhaust exhibited varying degrees of impact damage. Cylinders nos. 8 and 9 were impact damaged. Cylinders nos. 12 and 13 were separated. Cylinder nos. 10, 11, and 14 were partially attached. The front case and front accessory case was cracked in various locations, consistent with impact damage.



Figure 3: Forward section of the engine with the area of impact damage and displaced cylinders.

The intermediate rear case scavenge oil screen was removed and contained several metallic flakes. The main sump drain plug was removed and contained a small amount of metallic debris and dirt. The main oil screen was removed and contained a significant amount of metal particles/debris.



Figure 4: Intermediate rear case scavenge oil screen and metallic flakes.



Figure 5: Main oil screen metallic debris.

The oil pressure relief bypass valve was removed and disassembled. A small amount of metallic debris was observed within the relief valve.



Figure 6: Disassembled oil pressure relief bypass valve. Photo courtesy of Anderson Aeromotive Inc.

The scavenge pump removed and disassembled. A small amount of corrosion was observed on the scavenge pump gears. Scoring was observed on the inner walls of the scavenge pump body.



Figure 7: Disassembled scavenge pump.

The oil pump was removed and disassembled. Scoring was observed on the inner walls of the oil pump body. The internal gears exhibited varying degrees of corrosion.

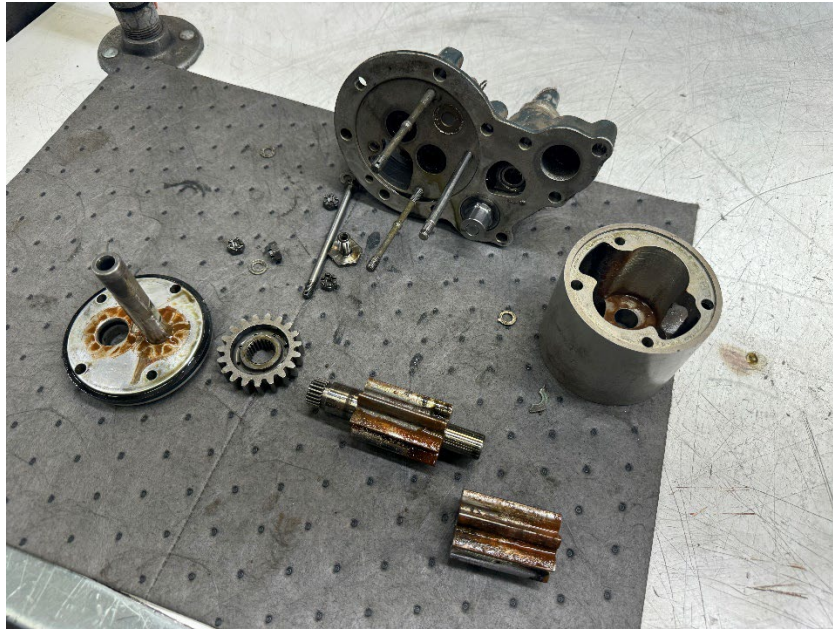


Figure 8: Disassembled oil pump.

The front case and propeller shaft were removed from the main case. Metallic fragments were observed throughout the front case. Fragments of the front secondary counterbalance bearing was observed on the front case side of the main case. Thermal discoloration of the front secondary counterbalance assembly was observed. The front secondary counterbalance bearing was fused to the crankshaft. The bearing was cut off using a cutting torch. Portions of the removed bearing exhibited thermal discoloration and scoring along the outer area of the bearing.



Figure 9: Portion of the front secondary counterbalance bearing.

The front cam was intact. The cam rollers were all intact and undamaged.

The front cylinders (cylinder nos. 1, 3, 5, 7, 9, 11, 15, 17) were removed along with the forward section of the main case. The pistons on cylinders no. 1, 3, 5, 7, 9, 11, 15, and 17, exhibited slight scoring on the piston skirts, however, were otherwise unremarkable. The front link rods and master rod moved freely once the cylinders and pistons were removed. No thermal discoloration was observed on the master rod or link rods. No visible areas of thermal discoloration were observed on any of the rear cylinder link rods, or master rod. The front crankshaft bearing was unremarkable. The counterweight was unremarkable.

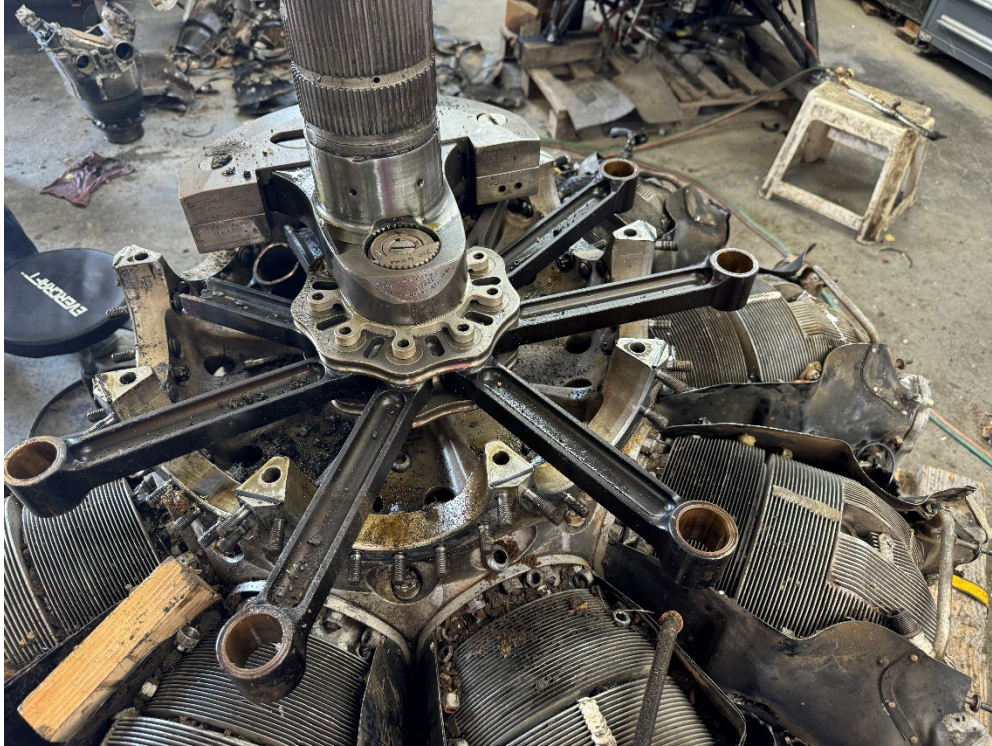


Figure 10: View of the front link rods, master rod, and crankshaft bearing assemblies.

The rear support assembly was removed, which exposed the rear counterbalance and counterbalance bearing. The rear counterbalance exhibited thermal discoloration, with scoring within the inner part. The rear counterbalance bearing exhibited severe scoring and displaced bearing material.



Figure 11: Rear counterbalance, rear counterbalance bearing, and rear cam. Photo courtesy of Anderson Aeromotive Inc.

The rear cam was intact. The cam rollers were all intact and undamaged.

Submitted by:

Joshua Cawthra
Deputy Regional Chief