



Aviation Investigation Final Report

Location:	Shafter, California	Accident Number:	WPR22FA331
Date & Time:	September 2, 2022, 11:00 Local	Registration:	N5943
Aircraft:	Yakovlev YAK-11	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot had departed in the accident airplane to orbit the airport following recent maintenance to the airplane. Shortly after takeoff, the pilot transmitted to his ground crew that the oil pressure had decreased; one witness told the pilot to land. A witness reported that the airplane was on the downwind leg for the runway when the engine lost power. Witnesses observed the airplane turn from the base leg to final for the runway, and shortly after, it stalled and entered a steep nose-down descent. One witness reported the airplane stalled while performing “S” turns. During the descent, when the airplane was about 500 ft above ground level the airplane appeared to flare. The ground scars and wreckage fragmentation patterns indicated that the airplane impacted terrain in a nose-down attitude with high forward velocity.

A video of the airplane showed that the airplane was in a left bank attitude during the nose-down dive. The airplane rolled right and pitched up just before impact. The video also showed that the propeller was rotating through the duration of the video.

The airplane had not been flown in about 6 years before the accident flight. Before the flight, the engine was removed from the airplane and sent out for maintenance. The cylinders were removed, the oil control rings were replaced, and the engine was reassembled with new seals and gaskets. The engine was placed on a test stand and ran at takeoff power for about 2 hours before it was reinstalled on the airplane.

Postaccident examination of the engine revealed that the front and rear counterbalances and counterbalance bearings were thermally discolored consistent with abnormal wear. The front secondary counterbalance bearing failed and was fused to the crankshaft. The rear counterbalance bearing exhibited severe scoring and displaced bearing material. An abundance of metallic debris was located throughout the engine and oil system, including the scavenge pump filter, engine oil filter, and sump plug.

While the engine had accumulated metal debris within the engine oil filter, there was evidence of the oil pressure bypass operating, which would allow oil to continue to flow throughout the oil system. The reason for the reduction in oil pressure and the subsequent loss of engine power was not determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's exceedance of the airplane's critical angle of attack, which resulted in an aerodynamic stall and subsequent impact with terrain. Contributing to the accident was the loss of engine oil pressure shortly after takeoff.

Findings

Aircraft	Angle of attack - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Aircraft	Recip eng oil sys - Unknown/Not determined

Factual Information

History of Flight

Approach-VFR pattern downwind	Loss of engine power (total)
Approach-VFR pattern final	Loss of control in flight (Defining event)
Approach-VFR pattern final	Collision with terr/obj (non-CFIT)

On September 2, 2022, about 1100 Pacific daylight time, a Yakovlev Yak-11, N5943, was destroyed when it was involved in an accident near Shafter, California. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

A witness located at the Shafter-Minter Airport (MIT), Shafter, California, reported that the pilot departed runway 30, and entered a climbing left turn with the intention of orbiting the airport. The witness stated that the pilot continued the left turn, until it was on a course that resembled the left downwind leg for runway 12. Shortly after, the pilot reported to his ground crew, who were monitoring the flight, that he had a low oil pressure indication; the ground crew told the pilot to land. The witness stated that about 3 to 5 seconds later he heard 2 popping sounds from the airplane followed by a loss of engine power. The airplane continued the left downwind and then turned onto the base leg. He stated that as the airplane turned final for runway 12, it appeared to stall. The airplane entered a nose-low, steep left bank attitude and descended rapidly into terrain.

Another witness stated that while the airplane was on final, the pilot performed an “S” turn from left to the right, and at the start of a second “S” turn, the airplane stalled, and “rolled up on its back” about 2,000 ft above ground level (agl). The witness stated that the airplane went into an almost straight-down dive, and as it rolled about 30° to the right it remained in a nose-down attitude until about 500 ft agl. The witness recalled that the airplane appeared to start a flare for a field; however, “didn’t round out, stalled, and impacted the ground in a flat attitude.”

One witness captured a video of the final moments of the accident sequence. Review of the video showed that at the start of the recording, the airplane was descending rapidly in a steep nose-low, left bank attitude (Figure 1). The airplane began to roll to the right and pitch upward, until just before impact, when the airplane rolled slightly left. Throughout the video, the propeller was observed rotating.



Figure 1: A capture of the start of the witness-provided video.

Pilot Information

Certificate:	Airline transport	Age:	74, Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Center
Other Aircraft Rating(s):	None	Restraint Used:	5-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	May 19, 2022
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 33000 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Yakovlev	Registration:	N5943
Model/Series:	YAK-11	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Experimental (Special)	Serial Number:	407
Landing Gear Type:	Retractable - Tailwheel	Seats:	1
Date/Type of Last Inspection:	Unknown	Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:		Engine Manufacturer:	P & W
ELT:		Engine Model/Series:	R-2800
Registered Owner:	On file	Rated Power:	2000 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

The logbooks were not obtained during the investigation. According to personnel from Anderson Aeromotive, upon receipt of the engine, they removed all the cylinders, changed the oil control rings, and reinstalled the cylinders along with various seals and gaskets. Once the work was complete, they installed the engine on a test stand and ran it at takeoff power for 2 hours with no issues noted.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KBFL,492 ft msl	Distance from Accident Site:	10 Nautical Miles
Observation Time:	10:54 Local	Direction from Accident Site:	122°
Lowest Cloud Condition:	Clear	Visibility	8 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	None / None
Wind Direction:		Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	29.83 inches Hg	Temperature/Dew Point:	35°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Shafter, CA	Type of Flight Plan Filed:	None
Destination:	Shafter, CA	Type of Clearance:	None
Departure Time:		Type of Airspace:	Class G

Airport Information

Airport:	SHAFTER-MINTER FLD MIT	Runway Surface Type:	Asphalt
Airport Elevation:	424 ft msl	Runway Surface Condition:	Dry
Runway Used:	12	IFR Approach:	None
Runway Length/Width:	4501 ft / 100 ft	VFR Approach/Landing:	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	35.519151,-119.21637(est)

Examination of the accident site revealed that the airplane impacted an open field on a heading of about 127° magnetic about 3,777 ft northwest of the approach end of runway 12 at an elevation of 397 ft mean sea level (msl). The wreckage debris path was about 392 ft in length and 60 ft wide. The first identified point of impact with terrain was a large swath of freshly disturbed dirt, which extended about 32 ft to an impact crater that contained 2 of the 4

propeller blades. The empennage separated from the fuselage and was located about 170 ft from the initial impact. The forward portion of the fuselage, which included the instrument panel, engine, and right wing, was located about 244 ft from the initial impact. All major structural components of the airplane were located within the debris path.

Examination of the recovered wreckage revealed that the oil line from the outlet port of the oil tank to the inlet port on the engine was separated and exhibited impact damage. The oil tank was impact damaged and breached. The oil line from the outlet port on the engine to the inlet port of the oil tank was separated and exhibited impact damage. The two oil lines (inlet and outlet) that extended from the oil tank aft to the two oil coolers were impact damaged, and mostly remained intact. The line interconnects (rubber tubing) were present. A very small amount of oil was observed on the fuselage directly above the oil coolers, consistent with seeping out of the coolers during postaccident storage. No evidence of leaks was observed throughout the airframe oil system.

Examination of the engine revealed that it was separated between the main case and the collector case. The collector case was impact damaged; a separated section remained attached to the main case. Internal examination of the collector case, intermediate rear case, and rear case sections revealed no evidence of 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. Cylinder Nos. 8 and 9 were impact damaged. Cylinder 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 2: 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.

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

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

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 3: Portion of the front secondary counterbalance bearing.

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 cylinder Nos. 1, 3, 5, 7, 9, 11, 15, and 17, exhibited light 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 and counterweight were unremarkable.

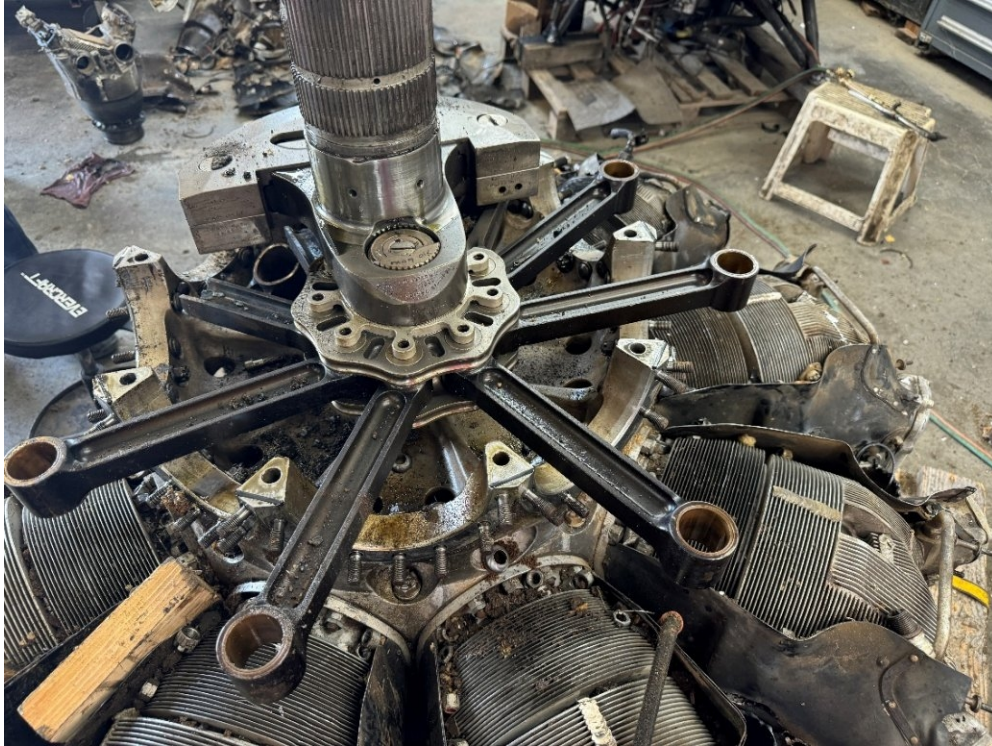


Figure 4: View of the front link rods, master rod, and crankshaft bearing assemblies.

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 area. The rear counterbalance bearing exhibited severe scoring and displaced bearing material.

Administrative Information

Investigator In Charge (IIC):	Cawthra, Joshua
Additional Participating Persons:	John Jensen; Federal Aviation Administration; Fresno, CA
Original Publish Date:	September 5, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=105852

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