



Rolls-Royce Engine Investigation Report

Accident Date: 18 July 2022
Accident Location: Verona, IL
Aircraft Type: Bell 206B
Aircraft Reg: N6BU
Engine Model: M250-C20B
Engine S/N: 833821
Engine Rating: 420 shp (takeoff)

Wreckage Exam Date: 14 August 2022
Wreckage Exam Location: Hendrickson Flying Service, Rochelle IL

The engine was examined in-situ on 13 August 2022 under the direction of the NTSB IIC with an investigator from the FAA FSDO present.

The aircraft was recovered to Hendrickson Flying Service and was positioned on the skid landing gear. The main rotor blades were removed prior to the arrival of the team.

The engine was secure and in place with no damage to the mounts. There was no external engine damage noted. The engine N1 system turned freely and was continuous from the compressor to the starter generator. The engine N2 system turned and was connected to the aircraft power train. No Foreign Object Damage (FOD) was noted on the first stage compressor blades or compressor inlet and the inlet particle separator system was intact and was not blocked. The fourth stage turbine wheel was normal in appearance when viewed from the exhaust collector.

Linkages from the collective to the Power Turbine Governor (PTG) and from the throttle twist grip to the Fuel Control Unit (FCU) were secure. The FCU throttle input lever was rigged appropriately and contacted the min and max stops when the throttle was rotated to the cut off and fly position respectively. The PTG rotated through ~20deg (from 60 to 80 on the indicator) when the collective was moved from full down to full up. Aircraft electrical power was switched on, and no engine chip lights were noted. The fuel quantity gage indicated 30 gal. The fuel boost pumps were individually tested, and fuel flowed freely from both.

All external air, fuel, and oil line connections were at least finger tight. A fuel sample was taken from the aircraft fuel filter bowl and left with the aircraft. The sample observed by the author was clear and normal in appearance.

The aircraft mounted scavenge oil filter was clean and full of oil which was normal in appearance and smell. The pending bypass button was not extended. Both the lower and

upper engine magnetic chip detectors were removed and inspected with no ferrous debris noted.

The engine was installed in a shipping container for future testing.

Engine Test Date: 3 November 2022

Engine Test Location: Keystone Turbine Services, Coatesville, PA

The engine was removed from the shipping container and installed in a turnover stand under the supervision of the PHL FAA FSDO Inspector with no damage noted to the container or engine. The engine mounted fuel filter was inspected with no contaminants noted in the filter element and residual fuel was observed in the filter bowl. A pneumatic leak check was performed on the fuel control system with no leaks detected. A cursory external exam of the engine revealed no damage.

The engine was installed on the test stand. During installation it was noted that the lower magnetic chip detector was inoperative, so a replacement detector was installed for the testing ¹. The engine started normally on the first attempt and stabilized at ground idle (~62%) within ~10 seconds.

The engine was shut down to inspect for leaks and then restarted after lunch for a full test run. A full post-overhaul engine test was conducted per Rolls-Royce Overhaul Manual 10W3 with no anomalies noted during testing.

Summary: The engine started, idled, and accelerated as designed during the testing with no flame outs or uncommanded power fluctuations noted. No anomalies were observed during the exam or testing which would have caused the reported power loss during the event. The predicted take off power at standard day conditions was 477shp, which is 13.6% above specification.

Figure 1. Engine Test Data Summary

	PREDICTED DATA				
	TAKEOFF	NORM CRUISE	CRUISE A	CRUISE B	CRUISE C
SPEC MGT (F)	1490	1360			1261
SPEC OUTPUT SHAFT POWER (hp)	420	370	333	278	300
SPEC SFC (lbm/hp-hr)	0.650	0.650	0.665	0.709	0.689
PRED SHAFT PWR AT SPEC MGT (hp)	477	406			337
PRED SFC (lbm/hp-hr)	0.601	0.614	0.644	0.681	0.642
PERCENT DELTA FROM SPEC PWR (%)	13.6%	9.7%			12.3%
PERCENT DELTA FROM SPEC SFC (%)	-7.5%	-5.5%	-3.2%	-3.9%	-6.8%

¹ The removed detector did not retain ferrous material and this condition would not affect engine performance during the event.

Engine Information:

Engine Model	250-C20B
Rating	420 Shaft Horsepower
Serial Number	CAE 833821
Total Time	Unk hrs ²

Component	Serial Number	Part Number
Engine 250-C20B	CAE 833821	6887190
Gearbox	CAG 27024	23001923
Compressor	CAC 31369F	6890550
Turbine	CAT 15266	23069745
PTG	25722	M250-10844
FCU	BR56494	23070606
Fuel Nozzle	AG8832	N/A
Bleed Valve	FF48578	23053176
Fuel Pump	T110590	6899253





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² Engine maintenance records were not provided.