

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR24LA067

AIRFRAME AND ENGINE EXAM SUMMARY REPORT

March 5, 2024

TABLE OF CONTENTS

A. ACCIDENT	3
B. AIRFRAME AND ENGINE EXAM SUMMARY REPORT	3
C. SUMMARY	3
D. DETAILS OF THE INVESTIGATION	3
1.0 AIRFRAME EXAMINATION	3
2.0 ENGINE EXAMINATION	6
3.0 MAIN ROTOR AND TAIL ROTOR ASSEMBLIES EXAMINATION.....	8

A. ACCIDENT

Location: El Centro, California
Date: December 23, 2023
Time: 22:30 Pacific standard time
Airplane: N111PM, Bell 206B

B. AIRFRAME AND ENGINE EXAM SUMMARY REPORT

IIC	Kristyn Blocher National Transportation Safety Board Federal Way, Washington
NTSB	Daniel Baker National Transportation Safety Board Federal Way, Washington
Party Coordinator	Jon-Adam Michael Rolls Royce Corporation Indianapolis, Indiana
Technical Advisor	Gary Howe Bell Textron Fort Worth, Texas

C. SUMMARY

Examination of the recovered wreckage was conducted on March 5, 2024, at the facilities of Air Transport Recovery in Phoenix, Arizona. The main rotor drive shaft was removed and shipped to the NTSB Materials Laboratory for further examination.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe examination

The aircraft was resting on the skids. The skids and cross tubes were unremarkable.

The fuselage, windscreen, cabin doors, cabin seat frames, upper and lower wire strike protection systems (WSPS), and tailboom assembly were undamaged (Figure 1).



Figure 1. View of right side of helicopter.

The battery was energized using the cabin mounted master switch. When the master switch was actuated, the chip detector warning light did not illuminate. The fuel selector valve was actuated and could be heard operating. The forward fuel boost pump was turned on, could not be heard operating, and fuel flow was not observed from the supply line. The aft fuel boost pump was turned on, could be heard operating, and fuel flow was observed from the supply line.

The hydraulic reservoir was secure at its connections to the transmission body. The hydraulic reservoir filter was free of debris and the reservoir contained hydraulic fluid. All pressure and return hoses remained attached at their fittings. Plastic bags were observed zip tied around each servo-actuator's end cap, encapsulating the end cap rod seals. Sponges were observed placed underneath the three servo-actuator rod seals. No binding was observed in the servo-actuators. The servo-actuators exhibited full travel and were not tested further.

The transmission was rotated by hand and rotated freely. The transmission chip detector was removed, no particulate matter was observed, and oil was present. The left and right pylon support links were secure at their pylon support fittings.

Main rotor continuity was observed when the mast was rotated by hand, through the transmission to the main rotor drive shaft. The KAflex coupling exhibited a fractured flex plate (Figure 2). The associated bolt and hardware assembly remained attached

to the flex plate. Multiple flex plates exhibited striations and witness marks consistent with contact with the isolation mount. The isolation mount exhibited gouging and witness marks, consistent with contact from the main rotor drive shaft and KAflex coupling assembly (Figure 3). The remainder of the upper deck surface was undamaged.



Figure 2. View of fractured KAflex plate.



Figure 3. View of isolation mount.

The transmission cowlings were undamaged. The engine cowlings were undamaged.

The rotating swash plate remained attached to the non-rotating swash plate. Flight control continuity was established from the cyclic control and the collective pitch control to the main rotor. Flight control continuity was established from the anti-torque pedals to the tail rotor assembly.

2.0 Engine Examination

Engine Manufacturer: Rolls-Royce
Engine Model Number: 250-C20B
Engine Serial Number: CAE-822637
Engine Rating: 420 Shaft Horsepower

All engine mounts were intact, and the engine was undamaged. Linkages from the cockpit controls to both the Power Turbine Governor (PTG) and the Fuel Control Unit (FCU) were checked with no anomalies noted. The bleed valve was open, and all external air, fuel, and oil line connections were tight. A pneumatic leak check was conducted of the fuel control system using shop air, with no leaks detected. The aircraft was equipped with an engine inlet barrier filter, which was intact and unobstructed. (Figure 4)



Figure 4. View of right side of engine.

The N1 rotor turned freely and was continuous from the starter generator to the compressor and first stage turbine wheel. The first stage turbine wheel was viewed via borescope, with no anomalies noted. The N2 rotor freewheeled when turned opposite direction of normal rotation. The first stage compressor blades, compressor inlet, and fourth stage turbine wheel were free of foreign object damage (FOD).

The engine oil and scavenge oil filters were free of significant debris. The scavenge oil filter pending bypass button was not extended. The oil reservoir was full of oil. The upper and lower magnetic chip detectors were free of ferrous debris.

The aircraft mounted fuel filter was full of fuel, which contained debris on the input (pre-filter) side. The fuel retained from the aircraft mounted filter was straw in appearance with sediment observed. The fuel nozzle was removed, and the primary and secondary orifices were not obstructed. The air shroud exhibited normal carbon sooting.

The power turbine governor, fuel control unit, fuel nozzle, fuel pump, and bleed valve were removed for bench testing at a local Rolls-Royce Authorized Maintenance, Repair, and Overhaul Center (HEROS Inc). Bench testing of the components revealed that each was functional.

3.0 Main Rotor and Tail Rotor Assemblies Examination

The main rotor assembly remained attached to the mast. Both main rotor blades remained attached to the blade grips, and the blade grips remained attached to the hub. Both main rotor blades were undamaged.

The tail rotor assembly exhibited no damage and was rotated by hand without binding. The tail rotor drive shaft maintained continuity from the engine accessory gear box to the tail rotor gear box. Oil was present in the tail rotor gearbox. The chip detector was removed, and no chips were observed.

Submitted by:

Kristyn Blocher
Air Safety Investigator