

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR23LA107

ENGINE EXAM

November 28, 2023

A. ACCIDENT

Location: Yuma, AZ
Date: February 06, 2023
Time: 21:35 local
0435 UTC
Helicopter: Bell OH-58A Engine 250-C20B

B. ENGINE EXAM

PARTICIPANTS

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C. SUMMARY

On February 6, 2023, about 2135 mountain standard time, a restricted category Bell OH-58A helicopter, N36FA, was substantially damaged when it was involved in an accident near Yuma, Arizona. The commercial pilot sustained minor injuries. The helicopter was operated as a Title 14 Code of Federal Regulations Part 137 agricultural aerial application flight.

The pilot reported that after the night application of chemical insecticide, he landed on the load truck and the chemical hopper was filled with 50 gallons of water. He maneuvered the helicopter to an open field in low light conditions and expelled the water to rinse out the applicator system. While he was maneuvering about 30 to 40 feet above ground level, with a speed near effective translational lift at 80% torque, the helicopter suddenly started to bounce and yaw. The pilot heard the turbine engine spool down as he held full throttle position, and the engine lost all power. The pilot arrested his forward movement by raising the nose. He then leveled the helicopter and started to descend. The pilot raised the collective to control the descent, but the helicopter landed hard. Subsequently, the main rotor blade struck and severed the tail rotor driveshaft and the main rotor blade mast was damaged. The main rotor blades separated from the mast and landed about 100 feet from the helicopter.

D. DETAILS OF THE INVESTIGATION

1.0 Engine information

Model Series: Rolls Royce T63-A720 (250-C20C)

Serial Number: CAE-405882

Rated power: 420 shaft horsepower

Engine Total Time: 1925.3

Time since inspection: 56 hours



Figure 1. Uncrating engine box

2.0 Pressure Sensing Lines

A Pc (compressor discharge air) leak check was performed at 80 psi. A soapy water solution was applied to the Pc system B-nuts and rigid tubing. Pressure was then decreased to 20 psi to check for leakage at the governor diaphragm. Minor bubbling was detected at three locations on the fuel control unit however, as the engine test would show, those leaks were not result in a fuel limiting condition.

3.0 Engine Run

Setup

- Engine was removed from the crate box which did have shipping damage confirmed by Rolls-Royce as pre-existing. A visual exam revealed the engine was unremarkable with no damage to the inlet, case, or gearbox. The left exhaust stack had minor impact damage from helicopter accident. All accessories and all corresponding lines remained intact and unremarkable. The fuel nozzle and igniter were found loose removed and found unremarkable. RR had mistakenly began prepping the engine.

- Chip plugs were removed and were free of fragments.
- Filters were removed with no fragments observed.
- All B-nuts were tight on fuel controller.

- The engine was attached to a test cell, The engine was attached to a test cell, which was operated with Test Logic (Software) by Arrow Aviation, Broussard, LA. Oil was cycled through the scavenge oil lines for the no. 8 and no. 6/7 bearings prior to startup. Fuel was also cycled throughout the system prior to startup.



Figure 2. View of right side of engine in test cell.

Run details.

- A borescope was used to observe the 1st-stage turbine section. The N1 rotor was turned via the compressor & no damage was observed.

- During test runs a chip light was observed and a start was stopped. The lower chip detector found a single metal fragment. The oil was changed with no reoccurrence during subsequent test runs.

- During one load test the engine dynamometer failed to meter a over torque and the engine auto shut down. RR representatives noted the failure of the test equipment not the engine.
- The motor was operated for a total of approximately 1 hour during evaluation.
- The engine was powered at different power N1 settings according to manufacturer standards and all observed values were within limits; no anomalies were observed.

Tach generators

-The N1 and N2 generators were evaluated. The N2 passed. On the N1 tach generator pole A to B tested 10volts, pole A to C tested 10 volts, and pole B to C tested 20 volts which was a test failure. When wired to a display gauge the N1 displayed to a distinguishable uncalibrated value.

Results

Test run revealed no anomalies or mechanical malfunctions during various power settings in accordance to Rolls Royce manufacturer standards.

Submitted by:

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Aviation Safety Investigator