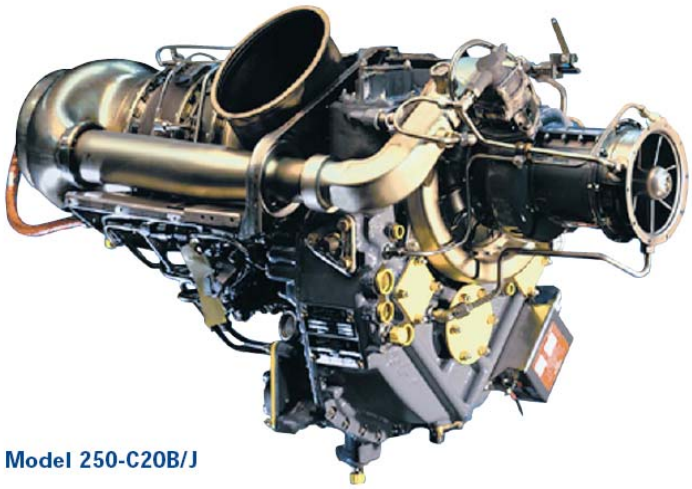
Rolls-Royce

Engine Investigation

Allison
M250-C20B
Engine CAE 801144F

Bell 206 B3
Registration: N777CP



Model 250-C20B/J

Wild Goose Airways
Lakeland, Florida

David Riser

Accident date: October 16, 2020
Investigation date: November 3-4, 2020
At Arrow: January 26, 2021
Report date: March 5, 2021

David Riser
Senior Air Safety Investigator

Report Enclosures:

Report Narrative

Appendix A, Engine Run Log

Appendix B, Photographs at Aircraft Recovery Location

Appendix C, Photographs Arrow Aviation

Appendix D, Rolls-Royce CSL 1100

Appendix E, Provided Engine Records

Background Information:

On October 16, 2020, at approximately 15:00 local time, a Bell 206 B3 helicopter, N777CP, was involved in an accident near Lakeland, Florida. The helicopter was registered to Wild Goose Airways. Visual meteorological conditions prevailed in the area at the time of the accident and no flight plan was filed.
According to the pilot's statement provided to the NTSB, the pilot was flying from the helicopter owner's property in Plant City to the Craig Airport (CRG) in Jacksonville, FL. He departed with 60 gallons of fuel on board the aircraft. Approximately 20 minutes into the flight at an altitude of 600' the pilot heard/felt a "binding" sound with a reduction in power accompanied by a slight nose left yaw. No annunciator or engine out warning was immediately evident, but as the pilot attempted to evaluate the gauges the low rotor RPM aural alarm sounded. The pilot then executed an auto-rotation into a heavily wooded area and the swampy terrain below. The main rotor blades contacted 50-100' trees as the helicopter descended through them. The tail boom was heavily damage and separated from the aircraft during the descent through the tall trees.

After the aircraft came to rest the engine was still running. The pilot cut fuel to the engine via the shutoff valve and rolling the throttle to the off position. He then cut power to the boost pumps at their circuit breakers. The pilot was able to self-extricate from the aircraft and make his way to a nearby road for assistance. The pilot was the sole occupant on-board the aircraft and was not injured in the accident sequence.

Airframe Observations at Recovery:

The helicopter was positioned upright on its skids which were intact. Both main rotor blades had been cut near the hub for transport. The tail boom was separated just aft of the fuselage. One segment of tail rotor drive shafting exhibited a heavy torsional fracture. The tail rotor gear box and tail rotor blades remained attached to the tail boom with both tail rotor blades generally undamaged. The fuselage exhibited various area of denting. Both front windscreens were broken with chin bubbles remaining intact. All doors and forward upper cowling had been removed prior to the examination. (Fig 1)

Engine Observations at Recovery:

The engine remained in position and securely attached to the airframe. No visible impact damage was noted to the engine. A visual and tactile examination of all engine pneumatic, fuel and oil lines was conducted. All “B” nuts and associated fittings were found to be at least finger tight with the exception of the Pc line “B” nut located at the fuel control unit which was present however it exhibited no thread engagement on the fitting and no torque striping was noted. Oil and fuel line interface connections between the engine and airframe were examined where all were found at least finger tight with no evidence of leakage. The power turbine governor was examined where collective movement resulted on correct movement at the governor. Throttle rotation resulted in free and smooth rotation with proper throttle response at the fuel control unit. (Fig 2)

Upon removal of the engine from the airframe both N1 and N2 drive trains were rotationally free and smooth. The compressor, accessory gearbox, turbine module and outer combustion case were all visually normal. The compressor inlet and visible blades and vane stages were visually normal with no evidence of FOD type damage. The compressor bleed valve was visually normal and the plunger was free and smooth during manual actuation. (Fig 3) Examination of both upper and lower chip detectors revealed both to be coated with clean oil and void of material. (Fig 4) Based on these observations the decision was then made to ship the engine to Arrow Aviation for run as received testing of the engine.

Engine Information:

An Allison M250-C20B gas turbine engine, S/N CAE 801144F, powered the helicopter. Engine records indicate the last major component change was a turbine replacement on August 7, 2020 at 1802.7 ETT.

Manufacturer	Allison
Engine Model	250-C20B
Rating:	420 Shaft Horsepower
Serial Number	CAE 801144F
Engine Total Hours	1877.4
Last 100-Hour Inspection	1802.7
Last 300-Hour inspection	1802.7

Component	Serial Number	Part Number	TSO	Total Time
Engine	CAE 801144F	6887190	Unknown	1877.4
Gearbox	CAG 20990F	6894171	Unknown	Unknown
Compressor	CAC 30984	6890550	Unknown	Unknown
Turbine	CAT 34578	2303824	Unknown	Unknown
Fuel Control	304585	M250-10816	Unknown	Unknown
Governor	BR44971	M250-10817	Unknown	Unknown
Fuel Pump	T1788	6899253	Unknown	Unknown
Fuel Nozzle	----------	----------	Unknown	Unknown
Bleed Valve	FF2963	23053176	Unknown	Unknown

❖ Engine total time and maintenance entries taken from aircraft log page entries. No engine log or component records were provided.

Engine Investigation:

On January 26, 2021 engine operational testing was conducted on the subject engine at Arrow Aviation in Broussard, LA. Testing was conducted to Rolls-Royce Overhaul specifications. Testing was conducted under the auspices of an FAA inspector on behalf of the NTSB IIC. The engine was removed from the container and placed onto an engine stand where preparation and pre run examination of the engine was conducted during which nothing was discovered which would preclude operational testing. The Pc line “B” nut at the fuel control unit which had been found with no thread engagement at the recovery site examination was tightened and torqued to proper specification. A Pc pressure test was conducted following Rolls-Royce Maintenance Manual specifications where no leaks were detected.

The engine was then placed into the test cell where the engine started within specification time and temperature and stabilized at ground idle power. Following engine warm up and with vibration scans being within specification, the engine was accelerated to a flight idle power. A power calibration check of the engine was then conducted where the engine met specification at all points including take off power. The engine was then shut down normally. (Fig 5)

Summary of Findings:

- Following proper installation and torqueing of the Pc line “B” nut at the fuel control unit, testing of the engine to Rolls-Royce overhaul test specification revealed the engine to meet all points of the specification.