



Rolls-Royce

Engine Investigation Report

**Model 250-C20B
Engine CAE 834648**



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Air Safety Investigations**

**Northwind Helicopter
Basin City, Washington**

**Accident date: 7 August 2018
Investigation date: 3 October 2018
Report date: 3 October 2018**

Background

On 7 August 2018, a Bell 206B, registration N607RA, was destroyed by fire following a hard landing in an open field shortly after completing aerial application work. The pilot was not injured. Daytime visual meteorological conditions prevailed at the time of the accident.

The wreckage was recovered to Auburn Municipal Airport and stored in a secure hangar.

On 3 October 2018, representatives from the NTSB, Bell and Rolls-Royce gathered at Auburn Municipal Airport to examine the wreckage.

This report presents the observations made during the investigation.

Accident Flight

The aircraft had been engaged in agricultural applications and had completed the day's spraying. The product hopper was filled with water for rinsing the applicator system, and the pilot took off to spray the water. After the applicator rinse was complete, the pilot was maneuvering close to the ground; he noticed an airframe vibration and subsequently lost control of the helicopter. The helicopter struck the ground in an upright position and the main rotor separated from the airframe.

The pilot reports that he exited the helicopter unhurt, but returned to the cockpit to retrieve personal belongings and to shut down the engine, which had continued to run. A fire of unspecified origin started and subsequently consumed the majority of the helicopter.

Aircraft Information

Model	Bell 206B
Serial Number	0678
Registration Number	N607RA
Airframe Total Time	UNK Hours
Last Inspection (100 hr):	UNK Hours

Engine Information

Engine Model	Allison 250-C20B
Rating:	420 HP
Serial Number	CAE-834648
Engine Total Hours	UNK Hours
Engine Last Overhaul	UNK Hours

Aircraft Examination

The aircraft was presented for examination in a secure hangar at Auburn Municipal Airport. The majority of the airframe and engine had been exposed to an intense post-accident fire.



The remains of the aircraft exhibited damage consistent with a main rotor strike of terrain. The main rotor assembly had fractured at the mast and separated from the airframe. One main rotor blade had fractured at the blade grip in apparent overload.

The tail boom was severed from apparent main rotor strike, and had also melted. The landing skids, while partially consumed by fire, did not appear to have been spread by a hard landing. The fuselage had been completely consumed by fire down to the floorboards.

Engine Examination

The engine was presented in a separate debris container from the fuselage. The engine was lifted from the container for examination. The engine was still partially attached to the horizontal and vertical firewalls, as well as loosely attached to the main transmission via various lines and cables. The magnesium accessory gearbox had mostly burned away, revealing the interior gear trains. The intensity of the magnesium fire also consumed or badly damaged the attached engine accessories. The engine had also been exposed to large amounts of water from firefighting efforts and the irrigation system of the field in which the aircraft had crashed. As such, significant corrosion had begun to set in on most engine components.



All available engine B-nuts and fittings were checked by hand for proper torque. All were found to be at least hand tight. The Power Turbine Governor was completely consumed by fire. The Fuel Control Unit was fire damaged and intact, but the control arm could not be manipulated by hand.

The bleed valve body was partially melted by the intense post-crash fire.

The compressor, like the rest of the engine, had been exposed to an intense post-crash fire. The composite compressor liner had melted and left ashen debris throughout the compressor. Examination of the compressor revealed no evidence of operational failure. The leading edges of numerous blades exhibited evidence of small hard-body impact marks.



Neither the N1 nor N2 rotor systems could be rotated by hand.

The turbine module exhibited no evidence of operational failure or malfunction. Visual inspection of the 4th stage (power turbine) revealed no evidence of FOD, operational damage or thermal degradation.



The igniter was removed to permit boroscope inspection of the 1st stage (gas generator turbine). Visual examination revealed no evidence of FOD or thermal degradation of the 1st stage nozzle or turbine blades. A significant quantity of metal slivers and chips were found adhered to the leading edges of the 1st stage turbine nozzle. Shiny metal splatter was also noted adhered to the turbine nozzle shield. The source of the metal slivers and chips was determined to be from the engine inlet plenum, where the airframe isolation mount was exposed to the rotating splined connector that disintegrated after the initial crash. The evidence observed is consistent with continued engine operation after impact, causing the splined connector to grind away material from the isolation mount which, in turn, was ingested by the engine and deposited within the turbine section. It is presumed that this metal ingestion was also the cause of the minor FOD damage noted earlier on the compressor blades.



The engine's lubrication system, along with both magnetic chip detectors, was mostly consumed by fire. The engine-mounted oil filter was intact and examined. It had been exposed to intense heat, and some of the filter's solder had melted and re-solidified within the filter housing and at the base of the filter itself. Otherwise, the filter was free of any debris.



The Fuel Spray Nozzle was removed and examined. The spray face was corroded but otherwise unremarkable.



Engine Maintenance and Records

Component	Serial Number	Part Number	TSO	Total Time
Engine	CAE-834648	6893660	UNK	UNK
Gearbox	CAG-30362F	6894171	UNK	UNK
Compressor	CAC-24066	TBD	UNK	UNK
Turbine	CAT-37400	6898735	UNK	UNK
PTG	UNK	UNK	UNK	UNK
FCU	BR-88090127	23070606	UNK	UNK
Fuel Pump	T108820	6899253	UNK	UNK
Bleed Valve	FF23335	23053176	UNK	UNK
Fuel Nozzle	UNK	UNK	UNK	UNK

At the time of this report, complete engine and aircraft log books were not available and are believed to have been destroyed on-board the aircraft in the post-accident fire.

Summary of Findings

Examination revealed no evidence of any condition which would have prevented the engine from delivering power. Available evidence suggests the engine was making significant power at impact and continued to operate for a period of time after the accident occurred.