



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

February 3, 2021

AIRFRAME & ENGINE EXAMINATION SUMMARY

CEN19LA318

This document contains 4 embedded photos.

A. ACCIDENT

Location: Hill City, South Dakota
Date: September 12, 2019
Aircraft: Bell 206B, N100CK
NTSB Investigator-in-Charge: Jason Aguilera

B. PARTICIPANTS

NTSB: Joshua Cawthra
National Transportation Safety Board
Federal Way, Washington

Participant: Mark Stuntzner
Bell
Forth Worth, Texas

Participant: Nick Shepler
Rolls Royce
Indianapolis, Indiana

C. SUMMARY

The recovered airframe and engine were examined at the facilities of Essential Flight, located at the Arlington Airport, Arlington, Washington, on February 3, 2021. The examination of the airframe revealed no evidence of any preexisting mechanical malfunction with the airframe. Visual examination of the engine revealed no evidence of any mechanical damage or malfunction; however, the engine was removed for further examination and a facility that is to be determined.



Figure 1: View of the helicopter as found for the examination.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

The recovered airframe was mostly intact, with the skids, main rotor blades, and aft section of the tailboom, which included the tailrotor, tailrotor gearbox, vertical stabilizer, was separated, consistent with tailrotor strike to the left side of the tailboom during an accident sequence. The left windscreen and lower left chin bubble were damaged, which was found consistent with main rotor blade contact to the left windscreen and chin bubble area during the accident sequence.

The transmission remained attached to the airframe via its mounts. The mast was bent about 10 to 20°. The static stops on the rotor hub exhibited hard static stop contact with the mast. Pitch change links were fractured and found to be consistent with overload / impact damage. The transmission spike plate was separated, consistent with the main transmission moving excessively during impact. Cracks on the upper area of the fuselage under the transmission was observed, consistent with impact forces.

The engine to transmission driveshaft was separated from the transmission, however, remained attached to the engine gearbox. The temperature indication strips were “white” in color, consistent with no evidence of overheating at the engine side. Grease splatter was observed throughout the internal areas of the forward cowling surrounding the separation area of the shaft coupling. The forward coupling was fractured into four pieces. The separation of the engine to transmission driveshaft was found consistent with impact.



Figure 2: View of the engine to transmission driveshaft.

The fuel shut off valve was in the “off” position. The throttle was observed in the “full on” position. All circuit breakers were “in” and not tripped.

The airframe fuel filter was intact, full of fuel, and free of debris. Minimal particulate was observed within the fuel filter housing. Power was applied to the airframe, and the fuel boost pumps were turned on. Fuel flow was obtained throughout the fuel system from the fuel tanks to the airframe fuel filter inlet line. Representatives from Essential Flight reported that during recovery of the helicopter, they removed about 50 gallons of fuel from the fuel tanks.

The main rotor blades exhibited multiple bends throughout, with some chordwise striations noted and bending opposite direction of rotation. The tailrotor blades exhibited chordwise fractures. The separated portions of the tailrotor blades were not present at the exam. The tailrotor drive shaft was separated immediately aft of the engine and gearbox. The fracture surfaces exhibited a slight torsional separation. The tailrotor gearbox rotated freely.

The hydraulic servos were intact and all lines remained attached.

Flight controls exhibited fractures in the collective and left and right cyclic tubes in the upper fuselage roof area, consistent with overload. Visual continuity was established throughout the collective and cyclic control system was obtained.

2.0 Engine Examination

The Rolls Royce 250-C20J engine, serial number CAE-271006, remained attached to the airframe via its mounts. All accessories remained attached and secure to the engine. No evidence of any mechanical damage was observed to the engine, nor was there any evidence of

fire damage. No evidence of any loose “B” nuts was observed, and all “B” nuts exhibited “torque stripes.” All pneumatic, oil, and fuel lines remained attached. N1 and N2 rotated freely by hand, with smooth rotation noted with no mechanical noise heard. Control continuity was established from the throttle twist grip to the fuel control unit. Control continuity to the power turbine governor via the collective pitch lever was established visually, and a fractured bellcrank was observed on the upper engine deck near the pitch control link and hydraulic servos. The damaged bellcrank was found to be consistent with impact damage.



Figure 3: View of the engine.

The compressor inlet and first stage blades were damaged, consistent with foreign object debris (FOD) ingestion.

Fuel was present at the inlet line to the engine fuel pump and appeared clean and free of debris.

The engine was removed from the airframe and placed in a shipping container for shipment for further examination.



Figure 4: View of the engine installed in the engine shipping container.

Submitted by: Joshua Cawthra