

ERA13FA273

Manchester, Kentucky

June 6, 2013

<u>2315 EDT</u>

Bell Helicopter 206 L-1; N114AE

NTSB ENGINE EXAMINATION

PARTICIPANTS IN THE EXAMINATION

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HISTORY OF FLIGHT

On June 6, 2013, about 2315 eastern daylight time, a Bell 206 L-1, N114AE, was destroyed when it impacted the ground in an elementary school parking lot while on approach to the company helicopter landing zone near Manchester, Kentucky. Night visual meteorological conditions prevailed; however, reports of patchy fog were reported by numerous eyewitnesses and a company visual flight rules flight plan was filed. The airline transport pilot and two medical personnel were fatally injured. The repositioning flight to the company helipad was conducted under the provisions of Title 14 Code of Federal Regulations Part 91 and had departed from the St. Joseph-London Heliport (5KY9), London, Kentucky about 2259.

ENGINE INFORMATION

Engine Manufacturer: Allison Engine Model Number: 250-C30P Engine Serial Number: CAE 895805 Recent Inspection: Event 1 – June 6, 2013

INITIAL EXAMINATION AS RECEIVED

The engine was shipped from the salvage facility in Griffin, Georgia to Rolls-Royce facilities in Indianapolis, Indiana via box and bonded shipment. Upon receipt the engine was immediately logged and placed in bonded/secure storage and was not opened. The box was viewed by the IIC on July 9, 2013 as unopened; it was photographed and opened for examination. The engine was removed from the box and placed on a table for disassembly.



Photo 1: Engine in Box After Opened

DETAILED EXAMINATION

Engine Overall

The engine exhibited crush damage on the right side as viewed from the rear of the engine and the entire engine exhibited thermal damage throughout. The power turbine governor (PTG) and bleed valve were not located within the box nor attached to the engine.

Component	Serial Number	Part Number
Engine 250-C30P	CAE 895805	23004545
Gearbox	CAG 95913	23035178
Compressor	CAC 92107	23051643
Turbine	CAT 95548	23035128
FCU	BR57351	23070613
Fuel Pump	388100-5	6896822
Fuel Nozzle	23077067	139972
1 st Stage Blade	X583506	63005

Compressor Section:

The impeller and shroud were removed for examination. The impeller blades exhibited soft damage and rub marks to several blades. The shroud, after wiped clean of soot, revealed score marks around the circumference with the deepest around the 2 to 4 o'clock position. The No. 2, No. 2 $\frac{1}{2}$, No. 3, and No. 4 bearings were rotated and exhibited minimal resistance which was a result of the thermal damage. The No. 3 and No. 4 bearing remained in place in the pinion gear. The power turbine to compressor coupling exhibited torsional fracture marks at the connection point with the spur adaptor gear shaft, consistent with rotation during the accident sequence.



Photo 2: Impeller



Photo 3: Impeller Shroud



Photo 4: Shroud Gasket as Found



Photo 5: Power Turbine - Compressor Coupling

Accessory Gearbox Section

The accessory gearbox was removed and exhibited extensive thermal damage. No evidence of preimpact malfunctions or abnormalities were noted.



Photo 6: Rear side of Accessory Housing



Photo 7: Front Side of Accessory Housing

Turbine Section

<u>1st stage turbine</u>

1st stage was removed and the No. 6 Bearing was examined and rotated smoothly by hand. All 8 bearing dampers were in place. All 1st stage blades were fractured near the blade root.



Photo 8: 1st Stage Turbine



Photo 9: No. 6 Bearing after Removal

 2^{nd} stage turbine The 2^{nd} stage was examined in place and exhibited numerous rotation scoring marks as well as evidence of FOD damage. Numerous blade tips exhibited hard damage and some blade tip fractures.



Photo 10: 2nd Stage Blades as Found

 $\underline{3^{rd}}$ stage turbine The 3^{rd} stage wheel and nozzle were separated, examined, and exhibited blade FOD and score marks on the blades. The wheel was also deformed on the right side along approximately onefourth of the circumference.



Photo 11: 3rd Stage Blades with Scoring on Outer Circumfrence



Photo 12: 3rd Stage Wheel with Impact Damage

<u>4th stage turbine</u> The 4th stage turbine was examined and indicated blade to vane contact as well as scoring witness marks along the outside circumference. Numerous blades exhibited fracture marks and the vanes exhibited gouge marks from blades.



Photo 13: 4th Stage Turbine Wheel as Viewed after Separation



Photo 14: 4th Stage Blade to Vane Contact

Exhaust Collector

The exhaust collector was removed and the No. 5 bearing was examined. All ball bearings and races for the No. 5 bearing were noted as in place and lubricated. The No. 8 bearing was examined and all ball bearings and races appeared to be in place and the bearing was lubricated. The No. 8 bearing rotated smoothly by hand with no resistance noted. The exhaust collector outer case exhibited numerous exiting marks around one-half of the circumference.



Photo 15: Exit marks on Exhaust Case



Photo 16: No. 5 Bearing as Found



Photo 17: No. 8 Bearing as Found

Combustion Section

The combustion outer case was removed and examined. The combustion liner exhibited impact damage on the right side as viewed from the rear of the engine. The fuel nozzle was examined and contained 5 $\frac{1}{2}$ shims at the combustion case. The fuel screen was free of debris. The fuel nozzle's part number was vibropeened and the manufacturer could not be confirmed at the time of the exam.



Photo 18: Interior of Combustion Case Liner



Photo 19: Fuel Nozzle with 5 1/2 shims after Removal



Photo 20: Fuel Screen

SUMMARY

The engine examination did not reveal any abnormalities that would have precluded normal operation including the capability of producing power during the accident sequence. Rotational signatures were noted throughout the different blade sections. Considering the damage and signature marks it is likely that the engine was producing power at the time of impact. However, engine operation and power output levels could not be determined from the engine components observed due to impact and/or thermal damage.

FUTURE ACTIVITES

None are planned at this time for this engine. The engine will be returned to storage at Atlanta Air Recovery in Griffin, Georgia and kept with the accident helicopter in preparation for the release of the wreckage by the National Transportation Safety Board IIC.