NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

May 4, 2019

AIRFRAME / ENGINE EXAMINATION SUMMARY

WPR19LA058

This document contains 0 embedded photos.

A. ACCIDENT

Location:	Colusa, California
Date:	January 7, 2019
Aircraft:	Beech A36, N100JB
NTSB Investigator-in-Charge:	Joshua Cawthra

B. DETAILS OF THE INVESTIGATION

1.0 Recovered Wreckage Examination

Examination of the recovered wreckage was conducted on February 12, 2019, at the facilities of Plain Parts near Pleasant Grove, California, by representatives of Textron Aviation and Rolls Royce, under the supervision of the NTSB investigator-in-charge.

The airframe was fragmented into multiple pieces. The instrument panel was displaced, with multiple instrument separation. One attitude indicator was located within the recovered wreckage and was disassembled. The gyro and gimble exhibited extremely light scoring. The power lever was found at flight idle, the condition lever was near "max RPM." The landing gear actuator was in the retracted position. One vacuum pump remained attached to an external drive assembly mounted on the firewall. The vacuum pump was disassembled, and all internal rotors and vanes were intact. The vacuum pump drive was intact and undamaged. Another vacuum pump was located within the recovered wreckage. All internal components were separated and not located.

Both the upper and lower wing attach points at the carry through spar remained attached to the carry through spar. However, the left and right wing structure was torn away from the attach points.

The left wing was bent and buckled throughout. The flap and aileron remained attached. The tip tank remained attached.

The right wing was fragmented into multiple sections. The outboard tip tank, and inboard portion (gear well) of the wing were recovered. A majority of the right wing was not recovered.

The vertical stabilizer was separated. The rudder was separated from its mounts. The left and right horizontal stabilizers were impact damaged (bent/buckled). The left elevator (inboard portion) remained attached to the horizontal stabilizer. The outboard portion and counterweight were located in the recovered debris. The left horizontal remained attached and was bent/buckled throughout.

Flight control continuity was unable to be established throughout the airframe. Fragments of the elevator, trim, and aileron control cables were located in the recovered wreckage. The fracture surfaces in the bellcranks or control cables exhibited evidence of being cut by recovery personnel or signatures consistent with overload separation.

The engine was separated from its mount. The compressor section was separated. The propeller gearbox and governor were separated and not recovered. The engine was shipped to a Rolls Royce facility for further examination.

No evidence of any preexisting mechanical malfunction was observed with the recovered airframe.

2.0 Engine Exam

Examination of the recovered engine was conducted at the facilities of Dallas Airmotive by representatives from Textron Aviation and Rolls Royce under the supervision of the NTSB IIC, on May 1 and 2, 2019.

The engine exhibited extensive impact and crush damage to all major modules with the exception of the gas producer and power turbine assemblies. The propeller gearbox housing was fractured at the gearbox connection pad. The propeller gearbox housing and associated components were not recovered. The propeller beta tube remained with the engine and was bent.

The axial compressor rotor, cases, and front support were fractured at the front of the compressor scroll. The right-hand elbow on the compressor scroll was separated. Immediately aft of this location, a large hole was observed in the gearbox adjacent to the right-hand engine mount. Only 1 of the 3 bolt holes on the mount remained, which was enough to support the engine in the turnover stand. The left hand and lower engine mount pads on the gearbox displayed no apparent damage.

The majority of the engine's external sheet metal components including the turbine heat shields, compressor discharge tubes, outer combustion case, and exhaust collector support were heavily damaged from impact forces. Nearly all of the external rigid tubing fuel, oil, and air lines exhibited some level of damage.

Visual and tactile inspection of the fuel, oil, air and electrical connections that were not separated from their respective attachment points appeared secure including various B-nut connections when checked using hand pressure.

The lower compressor case half exhibited inward crush damage. Both case halves and front support were removed to access the axial compressor rotor. The rotor contained numerous amounts of blade bending and tip curling damage opposite direction of rotation. Two adjacent blades on the 1st-stage row were fractured at their root (base). The observed fractures were consistent with occurring from overload forces during the impact sequence. Dried mud, dirt, and grassy vegetation were noted along the rotor's length. The compressor tie bolt was fractured aft of the 6th-stage blade row and in line with the pilot bore on the impeller.

Both compressor case halves showed significant damage to the majority of the vanes on all 6 stages. All of the vane airfoils were still intact but a large percentage were bent over in the opposite direction of rotor rotation. The compressor case lining contained large areas of heavy rub and grooving in the blade paths.

The compressor scroll was removed from the gearbox. Disassembly of the scroll revealed significant axial rub contact between the impeller and shroud. The forward end of the spur adapter gear shaft fractured and wedged inside the splined adapter. The aft portion of the compressor tie bolt, splined adapter, and forward spline portion of the spur adapter gear shaft was removed from the impeller shaft but could not be disassembled further.

The combustion section including the outer combustion case (OCC), discharge tubes, and combustion liner were removed from the turbine section. All of the components were heavily damaged from impact and crush forces. The combustion liner could not be removed from the OCC.

The turbine section was separated from the gearbox. The gas producer and power turbine modules were then separated from the exhaust collector. The support and both firewalls were heavily damaged from impact and crushing forces. The forward 4" of the turbine to compressor coupling shaft remained with the gearbox and still splined to the aft end of the spur adapter gear shaft after separation of the turbine section. The aft portion of the shaft was jammed onto the 2nd stage wheel splined adapter. Both sections of the shaft required the use of a slide hammer tool for removal. The power turbine shaft to pinion gear coupling remained with the gearbox and was easily removable. No apparent damage was noted. The power turbine shaft was fractured aft of the oil seal behind the #5 bearing. The forward end pilot diameter on the power turbine coupling was heavily scored around its entire circumference from rub contact with the power turbine shaft.

All of the exposed, readily accessible turbine gas path surfaces and airfoils, both blades and vanes, appeared undamaged and void of visually detectable thermal distress. Disassembly of the gas producer turbine showed significant evident of blade to track contact around an approximate 120° arc on both the 1st & 2nd-stages. Both stages of rub contact were in the same radial location when referenced off the axial center line of the rotor. The power turbine module could not be disassembled using conventional tooling due shafting damage resulting in inaccessibility of certain spline features.

The fuel spray nozzle was removed and inspected. The nozzle tip contained a layer of dried mud resulting in blocked of several air distribution holes. The nozzle body and threads were covered with rust colored dried mud and water residue. The nozzle was not disassembled further.

All of the mainline drive bearings, excluding the #2-1/2, 3, & 4, were removed and visually inspected during the disassembly process. All of the bearings were intact and oil wetted but felt notchy when rotated by hand. Random bits of dirt and other debris were noted on several of the bearings. The #2-1/2, 3, & 4 bearings remained part of the gearbox that was not disassembled during the exam process.

The gearbox assembly was stripped of its external accessories during the removal of the turbine section. The fuel pump drive shaft remained attached to its respective gearbox drive adapter pad. The drive shaft was removed and inserted into the pump after which the pump could be rotated using hand forces. No abnormalities were felt or noted. A small amount of fuel was pumped out

of the discharge side of the pump during the hand turning process. The fuel filter bowl was removed and the filter inspected void of any residual debris. There were small bits of black debris that settled in the bottom of the filter bowl along with approximately 2 teaspoons of clear fuel.

The propeller governor and fuel control units (FCU) were removed. Both were heavily covered in dried mud. The governor appeared mostly intact and the rotor could be turned with moderate resistance using hand forces. The fuel control unit was heavily damaged including at the connecting flange with the gearbox. The FCU also contained a large crack in the outer input drive housing wall adjacent to the connection with the main body of the unit. The input shaft could be rotated very easily by hand with no discernible resistance.

The magnetic chip detectors were removed and inspected. Both chip detectors were void of any readily detectable ferrous metal debris. The lower chip detector was covered with a large of wet, grey and rust colored sludge like material. The upper chip detector was oil wetted and normal in appearance.

The engine pressure oil filter was removed and inspected. The filter and housing were oil wetted and the filter contained random bits of non-ferrous dirt and debris on the outside and between the pleats. The oil filter housing on the gearbox contained approximately 2 teaspoons of oil that appeared dirty in color. There was also random dirt debris in the residual oil and the grey sludge like material on the inner wall of the housing. The filter assembly was not disassembled and inspected further.

The engine displayed no visible sign of pre-impact damage, fire, or mechanical malfunction.

Submitted by: Joshua Cawthra