



Examination Summary

NTSB ACCIDENT NUMBER: ANC19FA012

HISTORY OF FLIGHT

On January 29, 2019, about 1811 Alaska standard time, a twin-engine, turbine-powered Raytheon Aircraft Company (formerly Beech Aircraft Corporation) B200 airplane, N13LY, is presumed destroyed after impacting the waters of Frederick Sound following a loss of control while on approach to Kake Airport (PAFE), Kake, Alaska. The airplane was being operated by Guardian Flight as an instrument flight rules (IFR) air ambulance flight under the provisions of 14 *Code of Federal Regulations* Part 91 when the accident occurred. The airline transport pilot, flight paramedic, and flight nurse who was 27 weeks pregnant are presumed fatally injured. Visual meteorological conditions prevailed at the destination airport, and company flight following procedures were in effect. The flight departed Ted Stevens Anchorage International Airport (PANC), Anchorage, Alaska, about 1604 destined for PAFE.

AIRCRAFT INFORMATION

- Raytheon Aircraft Company B200
- S/N BB-1718
- Date of last inspection - 12/12/2018
- Continuous Airworthiness Program
- Airframe total time in service at last inspection – 5,226.0

WRECKAGE AND IMPACT INFORMATION

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The airplane impacted the ocean waters of Frederick Sound and was located on the ocean floor at a depth of about 500 ft. A cone shape debris field spanned about 1,650 ft on a bearing of 45°, with the lighter debris farther northeast due to the current.

Wreckage Location

56.9946241674 N; -134.4634091289 W

AIRFRAME EXAMINATION

The aircraft impacted ocean waters and was heavily fragmented.



Photo 1 - Accident airplane's wreckage at wreckage layout



Photo 2- Fuselage at wreckage layout

Cockpit

The instrument panel sustained impact damage and partially separated from the aircraft.

The following switch positions were noted:

- Ignition: Left – Arm, Right – Arm
- Ignition and Engine: Left – On, Right – On
- Avionics Master – Undetermined (loose)
- Left Gen: Undetermined (loose)
- Inverter – Off
- Engine Anti-ice: Left – On, Right – On
- Beacon – Undetermined (fractured)
- Strobe – Undetermined (fractured)
- Recognition – Undetermined
- Tail Flood – Undetermined (fractured and bent upward)
- No Smoke and FSB – On
- Pitot Mic – Normal
- Co-pilot Mic – Normal



Photo 3- Accident airplane's instrument panel

Left Wing

The outboard left wing, which included the left aileron, remained attached to the left wing structure by the aileron and aileron trim control cables. The control cables were observed twisted numerous times at the wing structure fracture.



Photo 4 - Outboard left wing structure

Left Aileron

Most of the left aileron remained attached to the outboard left wing. An approximately 3.5' long section of the outboard end of the left aileron had separated and was observed with the wreckage.



Photo 5 - Accident airplane's outboard left aileron

The aileron cables remained attached to the left aileron bellcrank and were continuous to the left wing root. The left aileron trim tab remained attached. The left aileron trim actuator was extended 1.8" which equates to approximately 5° tab down. The aileron trim cables remained attached to the trim actuator and were continuous to the left wing root.



Photo 6 - Left aileron trim actuator

Left Flap

The left inboard flap actuator was extended 2.55" which equates to about 0-10° extended. The flap actuator flex drive cable was fractured at the inboard flap actuator. The left outboard flap actuator was extended 2.95" which equates to about 10° extended. The flap actuator flex drive cable was partially separated, stretched and the strands were separated near the outboard flap actuator assembly. Due to the impact damage to the flap actuator flex cable the flap actuator measurements was not deemed a reliable source of preimpact flap settings.



Photo 7 - Left inboard flap actuator



Photo 8 - Left outboard flap actuator



Photo 9 - Flap flex drive cable

Right Wing

The right wing was heavily fragmented and appeared to sustain more impact damage than the left wing. The right wing structure was separated into multiple sections. The first major section included the inboard flap and aft spar section fragment from the wing root to the nacelle.



Photo 10 - Right inboard wing section

The next section of the right wing included the aft portion of the right engine nacelle and the right main landing gear along with about an 8' long section of the wing outboard of the nacelle. The outboard right flap was separated from the wing structure.



Photo 11 - Right engine nacelle and right outboard flap

The remaining outboard right wing structure consisted of about a 10' x 3' section of the top wing skin with the right aileron bellcrank attached. The right aileron bellcrank was found fractured. One of the right aileron control cables was continuous from the fractured bellcrank to the wing root. The other right aileron control cable was cut by recovery personnel about 3" from the bellcrank; the remaining length of cable was continuous to the wing root.



Photo 12 - Outboard right wing top skin

The right wing forward spar, lower spar cap, had been cut by recovery personnel near the fuselage and was bent downward toward the right main landing gear; it continued through the

bottom of the right engine nacelle and was about 15' long. An approximately 2' long section of the right wing forward spar, top spar cap, located outboard of the right engine nacelle, remained attached to an approximately 7' long section of the center wing, forward spar, top spar cap, that was cut by recovery personnel near the fuselage. The right wing aft spar was fractured into multiple pieces outboard of the right engine nacelle.

Right Aileron

The right aileron was not observed.

Right Flap

The right inboard flap actuator was extended 2.10" which equates to 0° extended (fully retracted). The flap actuator flex drive cable attachment fitting was fractured and separated at the right inboard flap actuator. The outboard right flap actuator was extended 1.70" which also equates to fully retracted. The outboard right flap actuator flex drive cable remained attached to the outboard right flap actuator.



Photo 13 - Right inboard flap actuator



Photo 14 - Right outboard flap actuator

Empennage

The top portion of the tail, which included most of the right horizontal stabilizer, right elevator, and about a 3' section of the left elevator, was separated from the vertical stabilizer. About 2' of the outboard right elevator was not observed.



Photo 15 - Right horizontal stabilizer and elevator

About a 4' long section of the left horizontal stabilizer leading edge skin and forward spar fragment were found separated from the structure. The remainder of the outboard left horizontal

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stabilizer, about a 6' long section, was bent downward. The remainder of the left elevator was not observed.



Photo 16 - Left horizontal stabilizer

The vertical stabilizer separated and exhibited leading edge impact damage. The rudder remained attached to its attach points and was relatively undamaged.



Photo 17 - Vertical stabilizer and rudder

Seats

The crew seats were recovered, both restraints were found unbuckled. One passenger seat was recovered and the restraint was found unbuckled. The base of a second passenger seat was recovered; however, the seat back and restraint were not recovered. All recovered seats exhibited impact damage. One rear seat was not recovered.

UNDERWATER BEACON

- Dukane DK-120
- Expired May 2018



Photo 18 – Dukane DK-120 underwater beacon

ENGINE EXAMINATION – LEFT

All positional references are in relation to view from aft looking forward. Upstream and downstream references are in relation to gas path flow from the compressor inlet to exhaust.

The LH engine was received wrapped in plastic. Removal of the plastic, revealed the engine with parts of the airframe mount, some airframe accessories, wiring harnesses, and firewall still attached. The external surfaces of the engine were covered with environmental debris. The Gas Generator and Power Section modules data plates confirmed the engine S/N RX0633.



Photo 19 - Left engine

The propeller hub flange and beta ring were still attached to the reduction gearbox (RGB) gear-train. The RGB housings had dissolved. The gears were visible and covered with environmental debris, but were not damaged. The 1st and 2nd stage planet gears could be rotated. The No. 4 bearing oil nozzle tip had been partially removed due to rotational wear. The compressor rotor and the power turbine (PT) rotor / propeller shaft were seized.

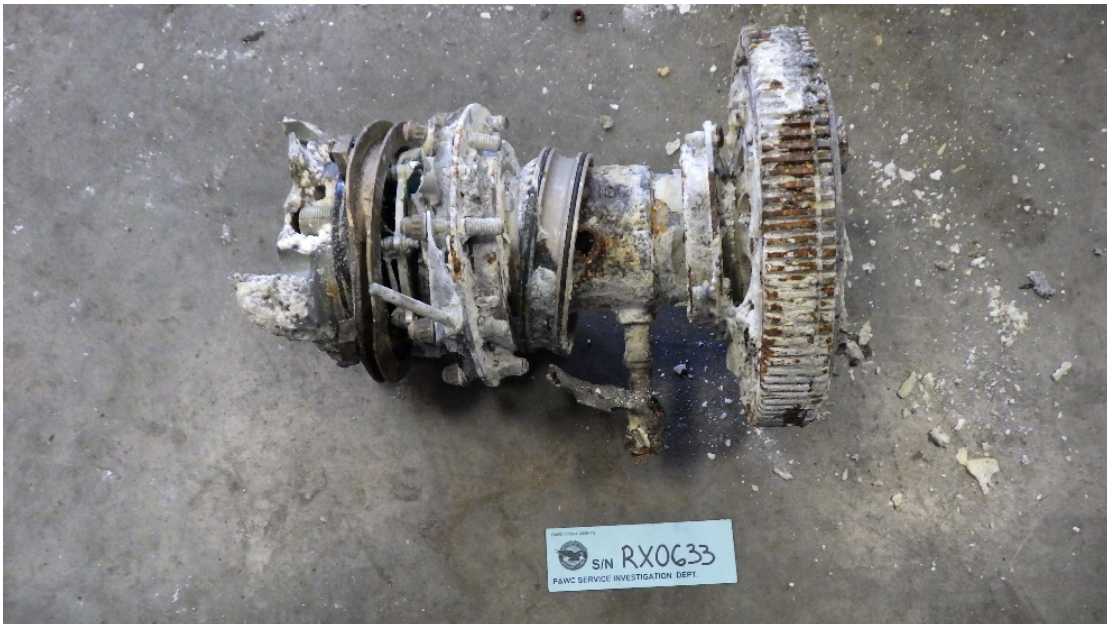


Photo 20 - Left engine propeller hub flange and beta ring

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The airframe component exhaust ducts were missing and ripped off at their flanges with some of the bolts still in place. The exhaust case was deformed, fractured and contained environmental debris. The Gas Generator Case (GGC) was mechanically deformed.

The Accessory Gearbox (AGB) housing had dissolved and most of the gears were not found. A portion of the inlet screen had rolled over on itself and a portion of the screen had been compressed inwards. The internal gas path of the inlet case was covered with environmental debris. Some compressor 1st stage blades found deformed without evidence of pre-impact Foreign Object Damage (FOD).

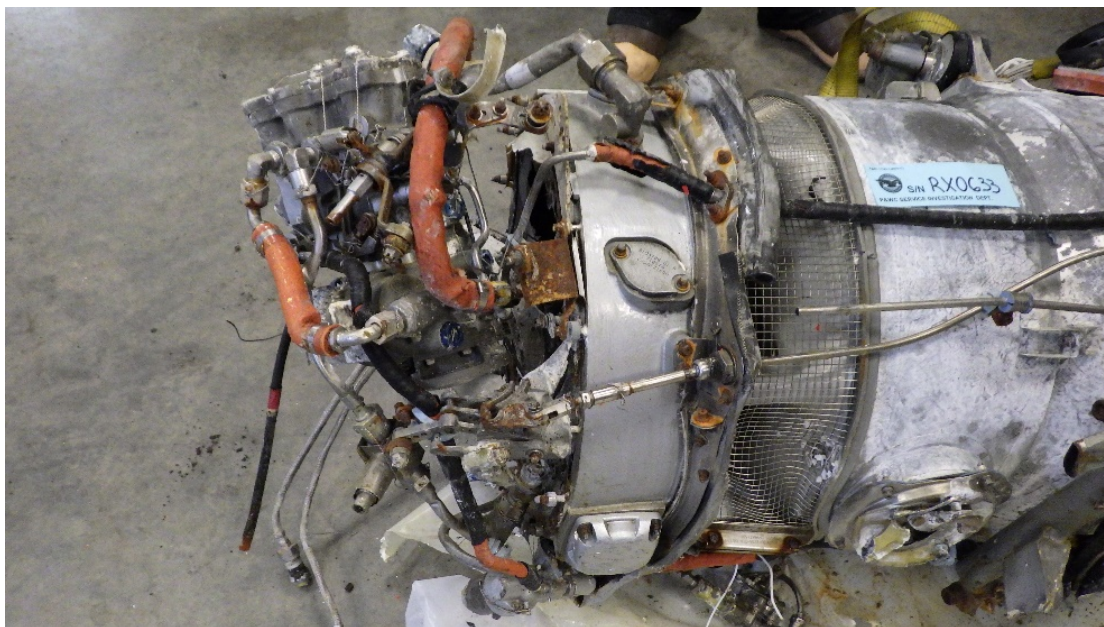


Photo 21 - Left engine accessory gearbox

The Power Control and Reversing Linkages were fractured. The connecting rod between the CAM box to the FCU was no longer present, fractured pieces at either end were found. The CAM box was mechanically damaged and fractured. The Fuel Control Unit (FCU) with the fuel pump still attached were found hanging loose due to the complete dissolution of the AGB housing. The FCU and fuel pump showed mechanical damages. The Min and Max adjustment screws were found in place. The FCU showed mechanical damages resulting in the fracture in the condition lever and deformation in the lever controls.

The Compressor Discharge Air (P3) pneumatic line was continuous from the Gas Generator Case (GGC) to the FCU, but showed mechanical damages due to impact. The lockwire at the P3 filter (downstream side) "B" nut was found broke, and the B" nut was found ¼ turn loose. The lockwire at the P3 filter (upstream side) "B" nut was missing, but the B" nut was tight. All other "B" nuts were secured with lockwire and tight. The P3 line was removed and found contaminated with some environmental debris. The P3 air filter was found with environmental contamination similar to the debris found in the P3 line.

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The Power Turbine Control (Py) pneumatic line was continuous from the FCU to the Propeller Governor (CSU) and torque limiter, but showed mechanical damages due to impact. All the “B” nuts were secured with lockwire and found tight. The Propeller Governor (CSU) was found hanging loose due to the complete dissolution of the front RGB housing. The CSU showed mechanical damages and the beta lever was not present. The Overspeed Governor (OSG) was not received with the engine. The Torque Limiter (TCU) was found hanging loose due to the complete dissolution of the front RGB housing. The TCU showed mechanical damages.

The RGB and AGB Chip Detectors were not received. The oil filter was clean and did not show signs of metal contamination. Both Ignition Plugs were still secured and tightened.



Photo 22 - Left engine oil filter

The Compressor Turbine disk downstream showed some rotational rubbing on the disk in the firtree region and under the blade platform. Some rotational contacts were also observed at the lip of disk center bore. The Compressor Turbine Shroud Segments presented a light rub, but exhibited normal operational wear. The Compressor Turbine Vane Ring was removed and found in good condition. It showed no signs of FOD. However, it was covered with environmental debris. The Combustion Chamber Liners were found to show mechanical damages from impact, but no evidence of any burning or overtemperature exposure was observed. Otherwise, they showed only operational wear. The Small Exit Duct was found in good condition.

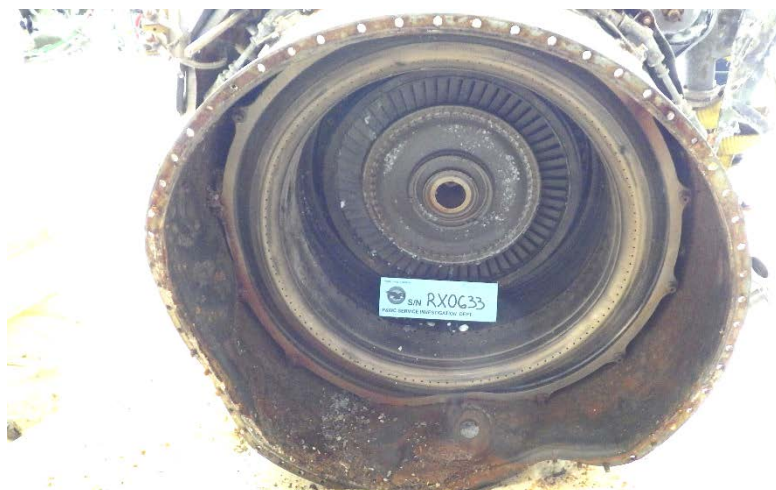


Photo 23 - Left engine compressor turbine disk

The Power Turbine (PT) vane ring and the Inter Turbine Temperature (ITT) Probes, Busbar, and Harness were found in good condition. The PT vane ring was removed and presented on the upstream side rubbing on the inner wall, around the center button and on the rivets. The PT vane ring presented on the downstream side exhibited on the shroud housing deep circumferential grooves from contact with the knife edges of the PT blades shroud tips. The PT vane ring inner and outer walls both showed circumferential rubbing contact from the PT blades firtree region and the edges of the shroud tips respectively. The 1st stage PT blades upstream showed rotational rubbing at the firtree region, the blade shrouded tips and the upstream side of the blade shroud tips. Due to access limitations, the 2nd stage PT blades were examined on the downstream side through the exhaust duct ports. The 2nd stage PT blades showed a rotational score at mid airfoil on some blades.



Photo 24 - Left engine power turbine vane ring

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The Compressor Bleed Valve (BOV) was removed and was found in the open position. The piston and the housing were covered with environmental debris. The piston moved freely through its full range of travel.



Photo 25 - Left engine compressor bleed valve

ENGINE EXAMINATION - RIGHT

All positional references are in relation to view from aft looking forward. Upstream and downstream references are in relation to gas path flow from the compressor inlet to exhaust.

The RH engine was received wrapped in plastic. Removal of the plastic, revealed the engine with parts of the airframe mount, some airframe accessories, wiring harnesses, and firewall still attached. The external surfaces of the engine were covered with environmental debris. The Gas Generator and Power Section modules data plates confirmed the engine S/N RX0634.



Photo 26 - Right engine

The propeller hub flange and beta ring were still attached to the RGB gear-train. The RGB housings had dissolved. The gears were visible and covered with environmental debris, but were not damaged. The 1st and 2nd stage planet gears could be rotated. The No. 4 bearing oil nozzle tip displayed rotational wear. The compressor rotor and the power turbine (PT) rotor/propeller shaft were seized.



Photo 27 - Right engine propeller hub flange and beta ring

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The left airframe component exhaust duct was missing and ripped off at its flange with some of the bolts still in place. The right airframe component exhaust duct was still attached, but was mechanically deformed. The exhaust case was mechanically deformed, fractured and contained environmental debris. The Gas Generator Case (GGC) was mechanically deformed, fractured.

The Accessory Gearbox (AGB) housing had dissolved and some of the gears were not found. The external scavenge pump was found hanging loose due to the complete dissolution of the AGB housing. A portion of the inlet screen had rolled over on itself, with a portion of the screen had been compressed inwards and punctured. The internal gas path of the inlet case was covered with environmental debris. Some compressor 1st stage blades found deformed without evidence of Foreign Object Damage (FOD).



Photo 28 - Right engine accessory gearbox

The Power Control and Reversing Linkages were fractured. The connecting rod between the CAM box to the Fuel Control Unit (FCU) was fractured at the end of the FCU and deformed. The CAM box was mechanically damaged and fractured. The FCU with the fuel pump still attached were found hanging loose due to the complete dissolution of the AGB housing. The FCU and fuel pump showed mechanical damages. The Min and Max adjustment screws were found in place. The FCU showed mechanical damages resulting in the deformation and fracture in the lever controls.

The Compressor Discharge Air (P3) pneumatic line was continuous from the Gas Generator Case (GGC) to the FCU, but showed mechanical damages due to impact. The lockwire at the P3 filter (downstream side) "B" nut was missing, and the B" nut was found 1/8 turn loose. The lockwire at the P3 filter (upstream side) "B" nut was found broke, and the B" nut was found 1/8 turn loose. All other "B" nuts were secured with lockwire and tight. The P3 line was removed and found contaminated with some environmental debris. The P3 air filter which was found wet (water) showed no debris contamination.

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The Power Turbine Control (Py) pneumatic line was continuous from the FCU to the Propeller Governor (CSU) and torque limiter, but showed mechanical damages due to impact. The lockwire at the firewall (GGC side) "B" nut was found broke, but the B" nut was tight. All the other "B" nuts were secured with lockwire and found tight. The CSU was found hanging loose due to the complete dissolution of the front RGB housing. The CSU showed mechanical damages. The beta lever was fractured, with a section still attached. The Overspeed Governor (OSG) was not received with the engine. The Torque Limiter (TCU) was found hanging loose due to the complete dissolution of the front RGB housing. The TCU showed mechanical damages.

The RGB and AGB Chip Detectors were not received. The oil filter was clean and did not show signs of metal contamination. Both Ignition Plugs were secured and tightened. One of the leads was fractured. The exciter box was found still attached to the airframe mounting strut and was mechanically damaged with both ignition leads fractured at their respective boss.



Photo 29 - Right engine oil filter

The Compressor Turbine disk downstream showed some rotational rubbing on the disk in the firtree region and under the blade platform. Some rotational contacts were also observed at the lip of disk center bore. The Compressor Turbine Shroud Segments presented a light rub, but exhibited normal operational wear. The Compressor Turbine Guide Vane Ring was removed and found in good condition. It showed no signs of pre-impact FOD. However, it was covered with environmental debris. The Combustion Chamber Liners were found to show mechanical damages from impact, but no evidence of any burning or overtemperature exposure was observed. Otherwise, they showed only operational wear. The Small Exit Duct was found in good condition.



Photo 30 - Right engine compressor turbine disk

The Power Turbine (PT) vane ring and the ITT Probes, Busbar, and Harness were found in good condition. The PT vane ring was removed and presented on the upstream side showing rubbing on the inner wall, around the center button and on the rivets. The PT vane ring presented on the downstream side exhibited on the shroud housing deep circumferential grooves from contact with the knife edges of the PT blades shroud tips. The PT vane ring inner and outer walls both showed circumferential rubbing contact from the PT blades firtree region and the edges of the shroud tips respectively. The 1st stage PT blades upstream showed rotational rubbing at the firtree region, the blade shrouded tips and the upstream side of the blade shroud tips. Due to access limitations, the 2nd stage PT blades were examined on the downstream side through the exhaust duct ports. The 2nd stage PT blades showed only normal operational wear.



Photo 31 - Right engine power turbine vane ring

The Compressor Bleed Valve (BOV) was removed and was found in the open position. The piston and the housing were covered with environmental debris. The piston moved freely through its full range of travel.



Photo 32 - Right engine compressor bleed valve

SUMMARY

The engines displayed contact signatures to its internal components characteristic of the engines developing power at the time of impact. There were no indications of any pre-impact mechanical anomalies to any of the engines components that would have precluded normal engine operation.

PROPELLER REMARKS:

The airplane was equipped with two 4-blade Hartzell propeller model HC-E4N-3G. Both propeller hubs fractured at the propeller shaft.

Left propeller:

- Blade 1 – exhibited torsional twisting
- Blade 2 – exhibited torsional twisting, leading edge gouging and missing tip
- Blade 3 – exhibited torsional twisting and leading edge gouging
- Blade 4 – exhibited torsional twisting



Photo 33 - Left propeller



Photo 34 - Left propeller blades

Right propeller:

- Blade 1 – exhibited torsional twisting and leading-edge gouging
- Blade 2 – exhibited torsional twisting and leading-edge gouging
- Blade 3 – exhibited torsional twisting and leading-edge gouging
- Blade 4 – exhibited torsional twisting and leading-edge gouging and a portion of the tip was missing



Photo 35 - Right propeller



Photo 36 - Right propeller blades