



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

November 8, 2019

EXAMINATION SUMMARY

ERA19FA248

A. ACCIDENT

Location: Elizabethton, Tennessee
Date: August 15, 2019
Time: 1537 EDT
Airplane: Textron Aviation Inc. 680A

B. INVESTIGATION PARTICIPANTS

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C. SUMMARY

On August 15, 2019, about 1537 eastern daylight time, a Textron Aviation Inc. 680A, N8JR, was destroyed during a runway excursion after landing at Elizabethton Municipal Airport (0A9), Elizabethton, Tennessee. The airline transport-rated pilot and copilot were not injured. The three passengers sustained minor injuries. The airplane was registered to JRM Air LLC and operated under the provisions of Title 14 Code of Federal Regulations Part 91 as a business flight. Day, visual meteorological conditions prevailed, and no flight plan was filed for the flight. The flight originated at Statesville Regional Airport (SVH), Statesville, North Carolina at 1519 and was destined for 0A9.

1.0 Accident Site

Airframe Examination (On scene August 16-17, 2019 and at Atlanta Air Recovery November 6-7, 2019)

Per security video, the aircraft touched down on the runway and bounced. The aircraft appeared to climb back up to about 25' AGL before it descended rapidly and landed hard on the runway. The right main landing gear collapsed, and the right wing tip contacted the runway. Skid marks from the right main gear and right main gear door indicated the aircraft traveled slightly to the left before it turned back to the right. The aircraft departed the end of the runway on center line and traveled down a grass covered hill for approximately 400'. The aircraft traveled over an approximately 25' wide creek. The left main landing gear and nose gear separated from the aircraft when it struck the opposite creek bank. The aircraft traveled up a small grassy hill and came to rest next to the west bound lanes of Highway 91. The aircraft came to rest on a heading of 285° at an elevation of 1,551'. A post-impact fire consumed the aft portion of the fuselage and inboard wing areas.

Control cable continuity was not established while on-site due to rapid recovery efforts. The pilots did not report any flight control issues during their interview with the NTSB-IIC. The left and right aileron trim actuators were extended 1.2". The left elevator trim actuator was extended 1.6". The right elevator trim actuator was extended 1.5". The rudder trim actuator was extended 1.1". Aileron, elevator, and rudder trim tab angular positions were not determined. The primary stabilizer trim actuator was measured. Textron Aviation Engineering compared it to an exemplar experimental aircraft and confirmed the cockpit display indication would have been approximately -1.3°. The flap selector was found in the #2 position (15° flaps extended). The on-site actuator measurements are listed below. Textron Aviation Engineering measured the flap actuators of an exemplar experimental aircraft with the flaps extended 15°; the findings are included in (red) below. The investigation confirmed the flaps were extended 15°.

The left inboard flap, inboard actuator was not examined. The left inboard flap, outboard actuator was extended 14.5” (14.375”). The left center flap, inboard actuator was extended 14.25” (14.125”). The left center flap, outboard actuator was extended 12” (12.0”). The left outboard flap, inboard actuator was extended 11.5”. (11.5”). The left outboard flap, outboard actuator was extended 9”. (9.25”).

The right inboard flap, inboard actuator was not examined. The right inboard flap, outboard actuator was extended 14.5” (14.375”). The right center flap, inboard actuator was extended 14”. (14.125”). The right center flap, outboard actuator was extended 12”. (12.0”). The right outboard flap, inboard actuator was extended 11.75” (11.5”). The right outboard flap, outboard actuator was extended 9.5” (9.25”).

Per the pilots, the aircraft departed with 8,800 pounds of fuel. The majority of the fuel system was destroyed by the post-impact fire.

The nose landing gear and the left main landing gear were impact separated from the fuselage when it crossed the creek. The right main landing gear remained attached to the right wing via the hydraulic landing gear actuator and remained under the wing during the post-impact fire. The right main gear trunnion pin, located on the forward side of the trunnion, remained attached to the trunnion assembly and the securing hardware was observed. The bearing to which it installs in the wing structure was separated from the wing structure and was not observed. The forward trunnion pin bearing installation hole in the wing structure was elongated. The aft trunnion pin was not observed because the aft trunnion assembly sustained post-impact fire damage and was melted. The aft trunnion bearing remained in place in the aft wing spar and was unremarkable. The upper bolt used to install the right main landing gear oleo to the trunnion assembly was sheared. The inboard hole of the upper oleo/trunnion installation knuckle attachment was elongated. The threaded portion of the bolt and nut, with cotter key installed, were found on the runway. The fracture surface of the bolt exhibited metallurgical overload signatures. The head of the bolt was not located during the examination of the wreckage.

Additional cockpit observations: Left and Right Engine Bleed Air – Norm; Cockpit Temp – Norm; Cabin Temp – Norm; Pitch Reconnect – Norm; Left and Right Fire Bottle switches – IN.

The aft cabin sustained significant fire damage. The toilet seat, located in the aft right corner of the cabin, and seat 8 directly forward of the toilet, were destroyed by the post-impact fire. The base of seat 9, the side facing seat located directly across from the toilet on the left side of the cabin, remained attached to the floor. The seat 9 back was destroyed by fire. The seat 7 base remained attached to the floor. The seat 7 back sustained fire damage. The seat 5 base was loosely separated from the post-impact fire damaged floor structure and was observed leaning toward the right side of the cabin. The seat 5 base, back, and restraint system sustained thermal damage. Seats 3 and 4, the aft facing seats, and seat 6 remained attached to the floor structure; the seats had minor soot damage. The cockpit seats were unremarkable.

Most of the avionics and instrument panel data was recorded by AReS and the Garmin G5000 data log software.

Additional cockpit observations included: PFD's, MFD, and all GTC lights – full on; left and right map light – Min; Oxygen – Passenger Oxygen Auto; Stand-by Power – Test; Fuel Crossfeed – OFF; APU Generator – On.

The power levers were found with the thrust reverser levers up. The power levers were located at the beginning of the reverse thrust range markings on the pedestal (idle speed). The left and right thrust reverser actuators, located in the engine nacelles, were found in the stowed position. The speed brake lever was in an approximately middle position.

The aircraft exit doors were examined at the accident site. During the examination of the emergency exit, it was noted that a metal post from the chain-link fence was impaled into the hatch, near the round hatch window. The post was removed by investigators, and then the hatch. Although there was extensive postaccident fire damage to the unit, the latching pin was found in the closed and latched position. The handle was manipulated by investigators and it operated in a normal manner with full range of motion.

The cabin entry door was examined. AReS data revealed that the fuselage rolled to the left about 42° before the evacuation. Investigators determined that, at that attitude, the exterior handle (paddle type) did impinge on the ground, preventing full extension of the handle. When the fuselage was lifted during the recovery of the wreckage, the door system was opened and closed fully without restrictions.

The Cockpit Voice Recorder and AReS box were recovered from the tail. The AReS box was shipped to the Wichita FAA-ACO and transported to Textron Aviation for data download. On 08-21-19, two representatives from the Wichita FAA-ACO, three Textron Aviation avionics engineers, and this investigator examined the AReS box. The compact flash card was removed, the card was imaged, and the data was downloaded. The data was provided to Textron Aviation Engineering for analysis. A report was produced and provided to the NTSB-IIC. The raw AReS data was exported to FT Reader and the CSV file was also provided to the NTSB.

An SD card, located in the top slot of the G5000 MFD, was removed from the aircraft and downloaded in the field. The data was provided to Textron Aviation Engineering for analysis.

The CVR was shipped to the NTSB Recorders Lab. On 09-25-19, the NTSB-IIC, an FAA AVP investigator, and a Textron Aviation flight test pilot attended the CVR transcription in Washington D.C. A copy of the CVR transcription will be obtained following release of the final report and the opening of the NTSB accident docket.

Per the AFM, the Maximum Certified Landing Weight of the aircraft is 27,575 lbs. The pilots stated the aircraft weighed 27,508 lbs at landing.

The Maximum Flap Extend Speeds are: Flaps 1 at 250 KIAS , Flaps 2 at 200 KIAS, and Flaps Full at 175 KIAS. Per the AReS data, Flaps 1 was selected at approximately 201 KIAS, and while they were extended, the airspeed increased to a maximum of 220 KIAS. Flaps 2 was selected at 195 KIAS. Flaps Full was selected at 174 KIAS.

The Maximum Landing Gear Operating/Extended Speed is 210 KIAS. Per the AReS data, the landing gear was selected DOWN at 205 KIAS.

Per the AFM, “Except where otherwise specified by AFM procedure, speedbrakes must be stowed prior to 500 feet AGL for landing.” Per AReS data, the speedbrakes were partially extended on final approach at about 250’ AGL (22° lever angle for about 5 seconds).

Per the AFM, the use of thrust reversers is prohibited during touch-and-go landings. Per the pilot’s statement and the AReS data, the thrust reversers were commanded to the Extend position during the first touchdown (bounce). Following the third touchdown (bounce), the power levers were moved to full power in an attempt to stow the thrust reversers and perform a go-around.

Engine Examination (Atlanta Air Recovery, November 6-7, 2019)

On November 6-7, 2019, the NTSB-IIC, an FAA inspector, a Pratt and Whitney investigator, a Pratt and Whitney maintenance technician, and this investigator examined the engines at Atlanta Air Salvage. The engines were at idle during the impact sequence and exhibited minor rotational signatures. The ignitors in both engines exhibited erosion. The oil and fuel filters appeared normal.

The visual and borescope examinations of the left and right engines did not reveal any evidence of any pre-impact mechanical anomalies that would have precluded normal engine operation.

There were no pre-impact mechanical anomalies evident that would have precluded normal operation of the engines.

Left Hand Engine Examination

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.

External Condition: The aircraft was partially burned and the wings were separated from the fuselage. The engines were viewed at the storage facility separated from the aircraft. The left hand engine was orientated in upright position, resting on the heat distressed aircraft cowling. The engine was moved to the inverted position to access the bottom of the aircraft cowling. The external engine components and the bypass ducts were coated in soot and exhibited evidence of being heat distressed from exposure to the post impact fire. The engine data plate showed that the engine serial number was PCE-CN0015.

External Cases

Intermediate Case: The visible exterior regions of the case were covered in soot and the paint was discolored.

Fan Case: The shroud region of the case was thermally damaged from exposure to the post impact fire. The visible regions of the case exterior were partially coated in soot.

Exhaust Duct: Soot and ash attached to the visible portion of the exterior of the case at numerous locations.

Outer and Inner Bypass Ducts: The visible sections of the outer and inner ducts were discolored and stained with soot from exposure the post impact fire.

Gas Generator Case: The case was not accessed for the purpose of this investigation.

Accessory Gearbox: The gearbox was coated with soot and the paint was discolored. The externally mounted accessories were attached to their respective mounting pad on the gearbox.

Fuel Shut Off Valve Cable/Linkage: The tripper lever was not extended above the valve housing, showing that the valve was not tripped. This indicates that the fuel flow through the valve was not interrupted. The valve housing was discolored and ash/debris from post impact fire was adhered to the exterior of the housing. The visible section of the cable was unremarkable. The cable was not removed for the purpose of this investigation.

Pneumatic Lines

Compressor Discharge Air (P3) Transducer Tube: The line was in place and secure.

P3 Pressure Transducer: The transducer was secure on its respective mounting pad on the bypass duct.

P1 Pressure Sensing Tube: The tube was not accessed for the purpose of this investigation.

I/T1 Sensors: The ends of the sensors located in the gas path were in place and coated with soot. The sensors were not accessed or removed for the purpose of this investigation.

Chip Detectors and Filters

Accessory Gearbox Chip Detector: No metallic debris was adhered to magnetic poles of the chip detector.

Oil Filter: The oil filter cover was distorted from impact damage. The damage to the cover prevented removal of the filter element. The filter was stained with soot from the post impact fire but the visible regions of the element did not display contamination that was related to engine operation.

Fuel Filter: No visible contamination was evident in the fuel filter. The residual fuel in the filter cover had a pungent fuel smell and it contained some dark colored particulate.

Inspection Observations: The engine was not disassembled for the purpose of this investigation. The visible external components were visually inspected and a borescope inspection was conducted on the accessible gas path components.

Low-Pressure (LP) Compressor Section

LP Fan Case and Shroud: The abradable shroud was deteriorated from exposure to the post impact fire. The visible portions of the external section of the case were partially coated in soot. The case was not removed for the purpose of this investigation.

LP Compressor Fan: The fan blades were discolored with soot from the post impact fire. The fan was not capable of manual rotation. The fan was not removed for the purpose of this investigation. The nose cone was discolored and stained.

Fan Exit Stator: The stator was viewed through/between the fan blades. Some of the stator airfoils exhibited impact damage, and the airfoils were stained. The stator was not removed for the purpose of this investigation.

Compressor Inlet Stator: The stator was viewed through/between the fan blades. The stator airfoils were stained. The stator was not removed for the purpose of this investigation.

High-Pressure (HP) Compressor Section: The accessory gearbox breather gear was manually rotated and the gear rotated freely. Mechanical continuity was confirmed between the gearbox and the HP compressor. A borescope was utilized to inspect the accessible compressor components.

Compressor 1st, 2nd, 3rd, and 4th Stage Blades: A borescope inspection of the 1st, trailing edge of the 3rd stage, and the leading edge of the 4th stage compressor blades was conducted and no visible damage was evident. The 2nd stage blades were not accessible with the borescope.

Inlet and 1st Stage Variable Guide Vanes and 1st Stage Shroud: No damage was evident on the visible inlet and 1st stage vanes. No visible rubbing was evident on the shroud.

Compressor 2nd, 3rd, and 4th Stage Stators and Shrouds: The 3rd and 4th stage stators did not display any damage. No visible rubbing was evident on the 3rd and 4th stage shroud. The 2nd stage stator and shroud were not accessible with the borescope.

No. 2 Bearing: The bearing was not accessed but the compressor rotation indicates that the bearing rotated freely.

No. 3 Bearing: The bearing was not accessed but the compressor rotation indicates that the bearing rotated freely.

Turbine Section

1st Stage High Pressure Turbine Guide Vane Ring: No visible damage was evident on the visible vane airfoils.

1st Stage High Pressure Turbine Shroud: The shroud segments exhibited a localized rubbed region from contact with the 1st stage turbine blade tips.

1st Stage High Pressure Turbine: The leading edge of the blade airfoils and blade platforms exhibited some erosion of their protective coating.

2nd Stage High Pressure Turbine Guide Vane Ring: No visible damage was evident on the vane airfoils.

2nd Stage High Pressure Turbine Shroud: The shroud segments exhibited a localized rubbed region from contact with the 2nd stage turbine blade tips.

2nd Stage High Pressure Turbine: The turbine blades did not exhibit any visible damage except some tip discoloration.

ITT Probes, Busbar and Terminal Box: The visible probes were unremarkable. One of the busbars was fractured adjacent to thermocouple mounting flange. The box was secured in place on its respective mounting position.

3rd Stage Low Pressure Turbine Guide Vane Ring: No visible damage was evident on the vane airfoils.

3rd Stage Low Pressure Turbine: No visible damage was evident on the blades.

5th Stage Low Pressure Turbine Guide Vane Ring: No visible damage was evident on the vane airfoils.

5th Stage Low pressure Turbine: No visible damage was evident on the blades.

Accessory Gearbox: The gearbox was not disassembled for the purpose of this investigation but the gear-train was manually rotated and the components rotated freely.

Exciter Boxes: The boxes were in place. The exterior of both boxes were thermally damaged from exposure to the post impact fire.

Ignition Leads: The leads were in place but exhibited corrosion and thermal damage in the regions that were exposed to the post impact fire.

Ignition Plugs: The plugs were removed and the tips were eroded adjacent to the central conductor. The erosion is consistent with operational use.

Fuel Heater: The heater exhibited some impact damage, the mounting bosses were fractured and the exterior housing was coated in soot.

Hydromechanical Fuel Control Unit: The control was in place, the housing was fractured, and the exterior housing was partially coated in soot.

Fuel Waste Ejector: The ejector was in place, coated in soot, and exhibited some thermal distress from exposure to the post impact fire.

Start and Dump Valve: The valve was in place and the exterior was discolored from exposure to heat and soot from the post impact fire.

Air System:

Compressor Bleed Valve Solenoid: The solenoid was in place and coated with soot.

Engine Electronic Control (EEC): The control was secured in place on its respective mounting pad. The exterior housing was burnt and discolored from exposure to the post impact fire.

Outer Electrical Wiring Harness: The harness was in place and all of the visible connections were attached to their respective components. The outer protective sheath was discolored.

Engine Diagnostic Unit (EDU): The unit was discolored and partially coated in soot. The EDU was forwarded to P&WC's Accessory Investigations for data recovery.

Right Hand Engine Examination

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.

External Condition: The right hand engine was lying on its right hand side of the heat distressed airframe cowling. The engine was moved to the inverted position to access the bottom of the aircraft cowling. The external engine components and the bypass ducts were coated in soot and exhibited heat distress from exposure to the post flight fire. The engine data plate showed the engine serial number was PCE-CN0016.

External Cases

Intermediate Case: The visible exterior regions of the case were covered in soot and the paint was discolored.

Fan Case: The shroud region of the case was thermally damaged from exposure to the post impact fire. The visible regions of the case exterior were coated in soot.

Exhaust Duct: Soot and ash were attached to the visible portion of the exterior of the case at numerous locations.

Outer and Inner Bypass Ducts: The visible sections of the lower section outer duct was discolored and stained with soot from exposure the post impact fire. The upper section of the outer bypass duct and the visible portions of the inner bypass ducts were thermally distressed and partially burned from the post impact fire.

Gas Generator Case: The case was not accessed for the purpose of this investigation.

Accessory Gearbox: The gearbox was coated with soot and the paint was discolored. The externally mounted accessories were attached to their respective mounting pad on the gearbox.

Fuel Shut Off Valve Cable/Linkage: The tripper lever was not extended above the valve housing, showing that the valve was not tripped. This indicates that the fuel flow through the valve was not interrupted. The valve housing was discolored and ash/debris from post impact fire was adhered to the exterior of the housing. The visible section of the cable was unremarkable. The cable was not removed for the purpose of this investigation.

Pneumatic Lines

Compressor Discharge Air (P3) Transducer Tube: The line was in place and secure.

P3 Pressure Transducer: The transducer was secure on its respective mounting pad on the bypass duct.

P1 Pressure Sensing Tube: The visible section of the tube was coated with soot.

P1/T1 Sensors: The mounting pads for the sensors were burned away. The sensors were discolored and coated with soot.

Chip Detectors and Filters

Accessory Gearbox Chip Detector: Some small particulate was adhered to magnetic poles of the chip detector.

Oil Filter: No visible contamination was evident in the filter.

Fuel Filter: The fuel filter cover was penetrated from impact damage. No visible contamination was evident in the filter.

Inspection Observations: The engine was not disassembled for the purpose of this investigation. The visible external components were visually inspected and a borescope inspection was conducted on the accessible gas path components.

Low-Pressure (LP) Compressor Section

LP Fan Case and Shroud: The abradable shroud was deteriorated from exposure to the post impact fire. The visible portions of the external section of the case were coated in soot. The case was not removed for the purpose of this investigation.

LP Compressor Fan: The fan blades were discolored with soot from the post impact fire. The fan was not capable of manual rotation. The fan was not removed for the purpose of this investigation. The nose cone was missing material and melted from the post impact fire.

Fan Exit Stator: The stator was viewed through/between the fan blades. Most of the stator airfoils were burned/missing from the post impact fire. The stator was not removed for the purpose of this investigation.

Compressor Inlet Stator: The stator was viewed through/between the fan blades. The stator airfoils were stained. The stator was not removed for the purpose of this investigation.

High Pressure Compressor Section: The accessory gearbox breather gear was manually rotated and some abnormal resistance was evident. Mechanical continuity was confirmed between the gearbox and the HP compressor. An audible noise was evident during the HP compressor rotation. A borescope was utilized to inspect the accessible compressor components.

Compressor 1st, 2nd, 3rd, and 4th Stage Blades: A borescope inspection of the 1st, trailing edge of the 3rd stage, and the leading edge of the 4th stage compressor blades was conducted and no visible damage was evident. The 1st stage blades were coated in soot. Some staining was evident on the 3rd and 4th stage blades. The 2nd stage blades were not accessible with the borescope.

Inlet and 1st Stage Variable Guide Vanes and 1st Stage Shroud: No damage was evident on the visible inlet and 1st stage vanes. The vane airfoils were coated with soot. No visible rubbing was evident on the shroud.

Compressor 2nd, 3rd, and 4th Stage Stators and Shrouds: The 3rd and 4th stage stators did not display any damage. No visible rubbing was evident on the 3rd and 4th stage shroud. The 2nd stage stator and shroud were not accessible with the borescope.

No. 2 Bearing: The bearing was not accessed but the compressor rotation indicates that the bearing rotated freely.

No. 3 Bearing: The bearing was not accessed but the compressor rotation indicates that the bearing rotated freely.

Turbine Section

1st Stage High Pressure Turbine Guide Vane Ring: No visible damage was evident on the visible vane airfoils.

1st Stage High Pressure Turbine Shroud: The shroud segments exhibited a localized rubbed region from contact with the 1st stage turbine blade tips.

1st Stage High Pressure Turbine: The leading edge of the blade airfoils and blade platforms exhibited some erosion of their protective coating.

2nd Stage High Pressure Turbine Guide Vane Ring: No visible damage was evident on the vane airfoils.

2nd Stage High Pressure Turbine Shroud: The shroud segments exhibited a localized rubbed region from contact with the 2nd stage turbine blade tips.

2nd Stage High Pressure Turbine: The turbine blades did not exhibit any visible damage except some tip deformation from the rubbing with the shroud segments.

ITT Probes, Busbar and Terminal Box: The visible probes were unremarkable. The visible portions of the busbars were unremarkable except for thermal discoloration. The box was secured in place on its respective mounting position and was thermally discolored.

3rd Stage Low Pressure Turbine Guide Vane Ring: No visible damage was evident on the vane airfoils.

3rd Stage Low Pressure Turbine: No visible damage was evident on the blades.

5th Stage Low Pressure Turbine Guide Vane Ring: No visible damage was evident on the vane airfoils.

5th Stage Low Pressure Turbine: No visible damage was evident on the blades.

Accessory Gearbox: The gearbox was not disassembled for the purpose of this investigation but the gear-train was manually rotated and the components rotated freely.

Controls and Accessories Evaluation

Ignition System

Exciter Boxes: The boxes were in place. The exterior of both boxes were thermally damaged from exposure to the post impact fire.

Ignition Leads: The leads were in place but exhibited corrosion and thermal damage in the regions that were exposed to the post impact fire.

Ignition Plugs: The plugs were removed and the tips were eroded adjacent to the central conductor. The erosion is consistent with operational use.

Fuel System

Fuel Heater: The heater was coated in soot.

Hydromechanical Fuel Control Unit: The control was in place and the exterior housing was partially coated in soot.

Fuel Waste Ejector: The ejector was in place and exhibited thermal distress from exposure to the post impact fire.

Start and Dump Valve: The valve was in place and the exterior was discolored from exposure to heat from the post impact fire.

Air System:

Compressor Bleed Valve Solenoid: The solenoid was in place and coated with soot.

Electrical System

Engine Electronic Control (EEC): The control was secured in place on its respective mounting pad. The exterior housing was burnt and discolored from exposure to the post impact fire.

Outer Electrical Wiring Harness: The harness was in place and all of the visible connections were attached to their respective components. The outer protective sheath was discolored.

Engine Diagnostic Unit (EDU): The unit was discolored and partially coated in soot. The EDU was forwarded to P&WC's Accessory Investigations for data recovery.