National Transportation Safety Board

Office of Aviation Safety
Washington, D.C. 20594

Group Chairman's Factual Report

AIRWORTHINESS

CEN17MA183

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A. ACCIDENT INFORMATION

Operator:	Trans-Pacific Jets
Location:	Teterboro, NJ
Date:	May 15, 2017
Time:	1529 Eastern Daylight Time
Aircraft:	Gates Learjet 35A
Registration Number:	N452DA

B. AIRWORTHINESS GROUP

On-Scene Investigation, May 16-17, 2017:

Chairman:	Adam M. Gerhardt National Transportation Safety Board Ashburn, VA
Member:	Michael Lemay Bombardier Montreal, Quebec, Canada
Member:	David Studtmann Honeywell Phoenix, AZ

C. SUMMARY

On May 15, 2017, at 1529 eastern daylight time, a Gates Learjet 35A, N452DA, operated by Trans-Pacific Jets, departed controlled flight while on a circling approach to runway 1 at the Teterboro Airport (TEB), Teterboro, New Jersey, and impacted a commercial building and parking lot. The captain and first officer died; no one on the ground was injured. The airplane was destroyed by impact forces and postcrash fire. The airplane was registered to A&C Big Sky Aviation LLC and operated by Trans-Pacific Air Charter LLC under the provisions of 14 Code of Federal Regulations Part 91 as a positioning flight. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan was filed. The flight departed from the Philadelphia International Airport (PHL), Philadelphia, Pennsylvania, about 1504 and was destined for TEB.

The Airworthiness Group Chairman traveled to Teterboro, NJ on May 15, 2017. The group chairman was briefed by the NTSB Investigator in Charge (IIC) on the following day's plan. The Airworthiness Group was formed with party members from the airplane's type certificate holder and the engine manufacturer on May 16, 2017. On May 16-17, the airworthiness group members examined the airframe and engines at the accident site. The group reconvened on May 18, 2017 at the Teterboro Airport Management Office in Teterboro, NJ, where factual airframe and engine examination notes were completed. After the on-site activity, all pertinent documentation and photographs were provided to each of the parties.

The group did not determine any evidence of an airframe or engine malfunction. There were no further examinations of the airframe or engine.

D. DETAILS OF THE INVESTIGATION

1.0 Aircraft Description

N-number:	N452DA
Airplane Serial Number:	35A-452
Airplane Manufacturer:	Gates Learjet
Model:	35A
Airplane Year:	1981
Airworthiness Certificate:	Standard
Approved Operations:	91/ 135
Aircraft Type:	Fixed Wing Multi-Engine
Engine Type:	Turbo fan
Airplane Category:	Transport
Number of Engines:	2
Type Certificate	A10CE, Revision 67

2.0 Accident Site

The accident site was located about .70 nautical miles 180° south from the threshold of runway 1 at TEB. The main wreckage was located at 40° 49’ 46” N, 74° 3’ 37" W. The wreckage path and debris field were about 315 ft. long on a 135° heading.

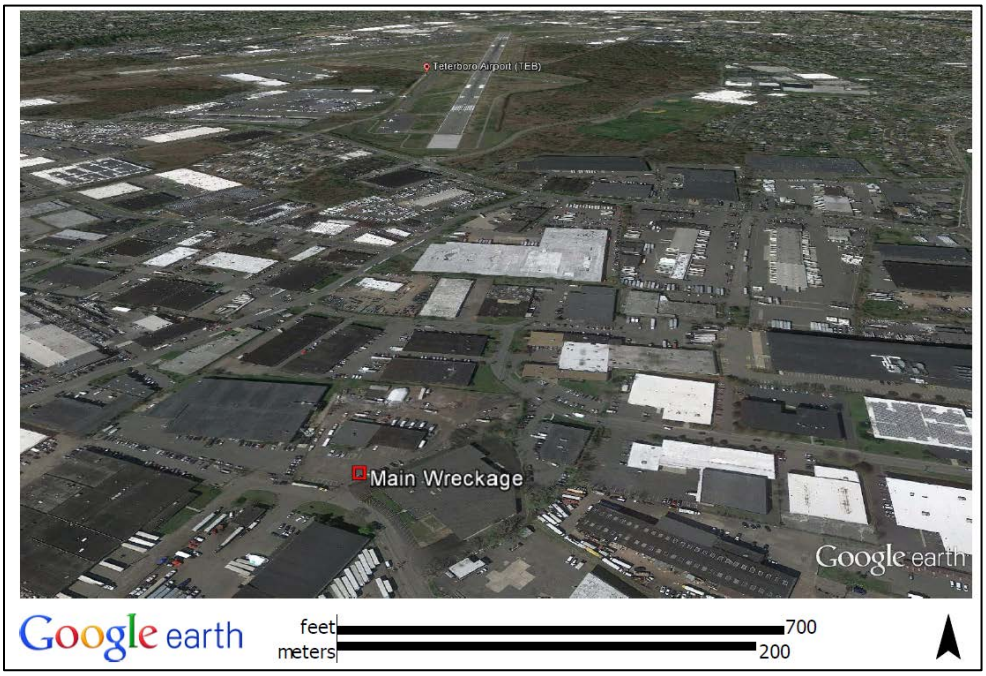

Figure 1: Google earth image of accident site location and arrival airport

Figure 2: Overhead view looking north at initial impact point and runway 01 at TEB

Figure 3: Overhead view looking southeast at the debris path and main wreckage

3.0 Wreckage Debris

The Bergen County Prosecutor's Office completed a station laser scan of the accident site. Figure 4 shows the location of the major airframe and engine components, and table 1 provides descriptions for the numerical labels.

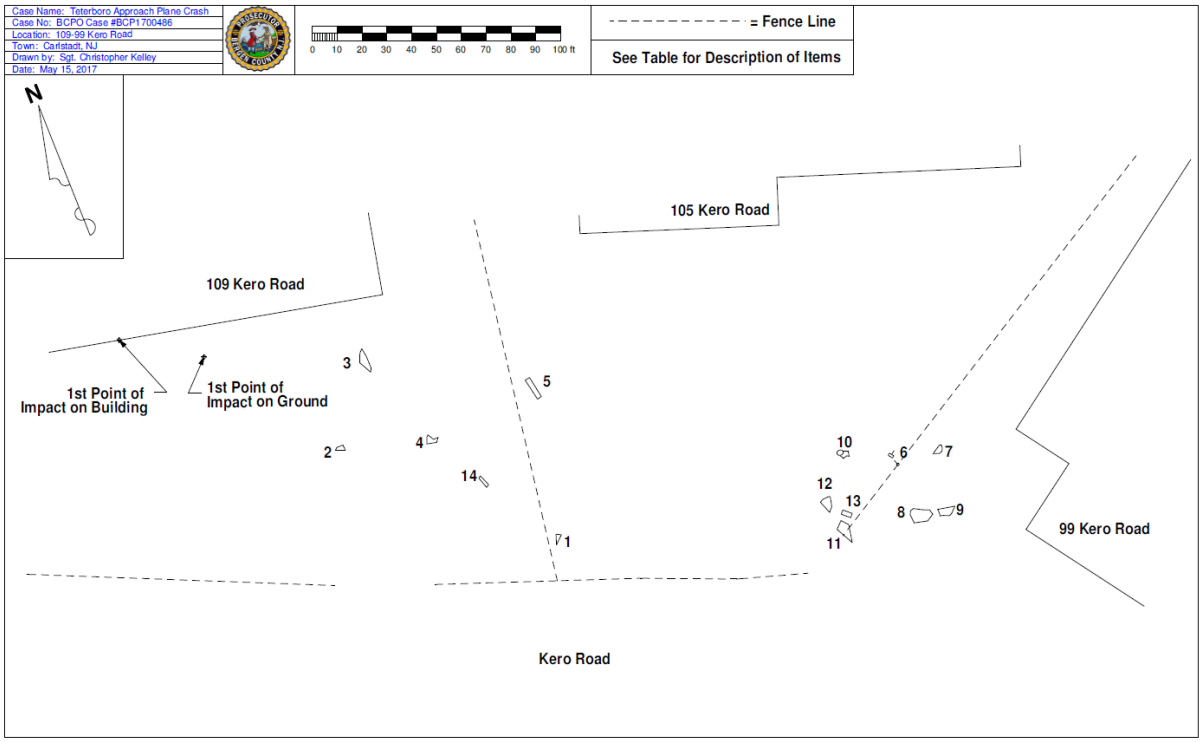

Figure 4: Station laser scan of the accident site

Table 1: Accident Site Laser Scan Item Description	
Item #	**Item**
1	Aft section of left wing tip tank
2	Right aileron
3	Inboard right wing and right main landing gear
4	Aft portion of the right tip tank
5	Right flap
6	Left main landing gear
7	Right rudder pedal control linkages
8	Left engine section
9	Additional left engine section
10	Right engine core section
11	Additional right engine core section
12	Lower portion of vertical stabilizer
13	Horizontal stabilizer
14	Left elevator

The first point of impact was near the “M” on the roof of the Manhattan Door Office Building, about 30 ft. above ground. The items found were the right tip tank access panel and a fragment of what appeared to be the green navigation light.

The first ground impact point: There were three ground scars located near the initial impact point below the roof of the Manhattan Door building. The first ground scar was about 6 ft. by 32” and various fragments of the right wing tip tank were located.

Figure 5: Right wing tip tank initial impact

Inboard right wing (item # 3) and right main landing gear: The right main landing gear was tucked into the wing. The right flap (item #5) was separated from the wing, and located in the debris field. Seven feet and 9 inches of the inboard right wing was located. Five crushed right-wing spars were located near the inboard right wing.

Right aileron (item #2): The right aileron and balance tab remained attached. The cap at the top of the vertical stabilizer was found nearby. The right aileron was crushed inward, about 38” were measured. Fragments of the right-wing tip tank were also located. An aft portion of the right tip tank was located in the debris field (item #4).

Left elevator (item #14): A portion of the elevator separated from its attach points, about 5 ft. was measured. One hinge remained attached.

Aft section of left wing tip tank (item #1): The tip tank was separated from the wing and fragmented. The aft 5 ft. portion were located.

Core of the right engine (item #11): Located and separated from the fan section of the engine.

Lower portion of vertical stabilizer (item #12): 4 ft. of the flight control cable pulleys were located. The torque tube and control cables were observed running forward about 6

ft. from the rudder flight control surface. The horizontal stabilizer trim actuator was found attached to its attach points.

Horizontal stabilizer (item #13): The horizontal stabilizer was located up side down within the debris field. Near the horizontal stabilizer, the left wing root was located. The cockpit voice recorder was separated from its attach points and was located under the left wing.

Right engine core section (item #10): The right engine core section was separated from the fan section.

Left main landing gear (item #6): The left main landing gear was separated and the lower torque link was fractured. Near the left main landing gear, the nose gear was also located and found separated from its attach point.

Right rudder pedal control linkages (item #7): The right rudder pedal control linkages were separated from the main wreckage. The passenger door was located near this point.

Forward of the main wreckage: The forward portion of the right wing tip tank was located. Both engines were fragmented, separated from the empennage and located near the furthest points of the debris field.

The engines' installation positions were identified based on the mainframe mount locations. The left engine (item #8, 9) was approximately 25 ft. further down the debris field as compared to the right engine. Compressor section stator vanes and fractured fan blades were located about one third of the way into the debris field indicating that at least one of the engines began to separate early into the impact sequence.

4.0 Airframe Examination

The airframe was fragmented due to impact and fire damage. The left aileron wing quadrant was found to be intact with cables attached. The right aileron wing quadrant was found to be intact with cables attached. The rudder quadrant had cables still attached to it and cables had continuity through the aft tail cone section. The elevator cables had continuity through the tail cone. The elevator down spring assembly was found to be intact. The elevator horns and down rods, right elevator horn was found intact, and the left elevator horn was cracked due to impact damage. The elevator down rods were both damaged.

Flaps

The flap tracks were all found intact.

Figure 6: Right flap track

Figure 7: Right wing flap

The outboard edge of the right wing flap did not exhibit signs of damage consistent with aileron interference. The outboard edge of the left wing flap was crushed during the impact.

Figure 8: Right flap inboard nose roller bracket

The right flap inboard nose roller bracket was bent and no cracks were observed. The right flap inboard flap track bracket was inspected for cracks in the radius and none were observed.

Figure 9: Flap measurement

The left flap actuator extension was measured and was about 19". According to the airplane manufacturer document, the fully retracted dimensions are 12.950 and the fully extended position is 19.140, as per engineering drawings. The dimensions taken indicate the actuator, as found in the wreckage, was in the fully extended position (flaps 40°).

Empennage

Figure 10: Rudder section

The rudder sector was bent, but intact. The rudder control cable remained attached to the rudder sector.

Figure 11: Right elevator section

The right elevator control horn remained attached to the horizontal stabilizer and the elevator. The left elevator control horn remained attached to the horizontal stabilizer.

Wings

Figure 12: Ailerons

The left aileron cable continuity ran through the left wing section to what remained of the left aileron. The break in aileron cables were consistent with disruption from impact forces.

Figure 13: Right spoiler

The right spoiler was found down and locked.

Figure 14: Left spoiler

The left spoiler was found down and locked.

Landing Gear

According to the airplane manufacturer document, the main landing gear actuator extension dimensions in the down and locked position is 45.79” reference. Measurements indicated that the left and right main landing gear actuators were fully extended.

Figure 15: Landing gear actuators

According to the airplane manufacturer document, the nose gear actuator extension dimensions in the down and locked position is 33.79”. Measurements indicated that the nose gear actuator was fully extended.

Figure 16: Nose gear actuator

Cockpit Instrumentation and Other Items

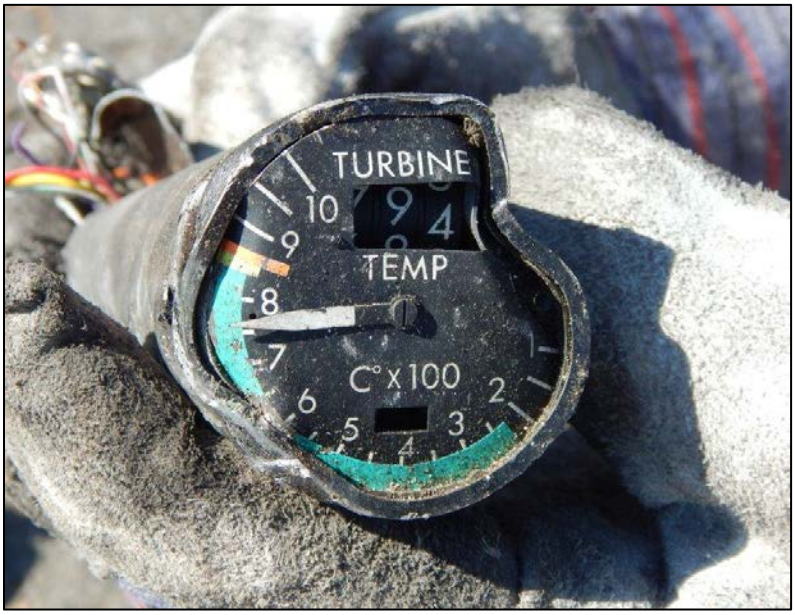

Figure 17: Inlet turbine temperature gauge

The inlet turbine temperate (ITT) gauge reading 794° C was noted on the gauge. Both thrust levers were found together about ¾ of the way forward (toward max thrust).

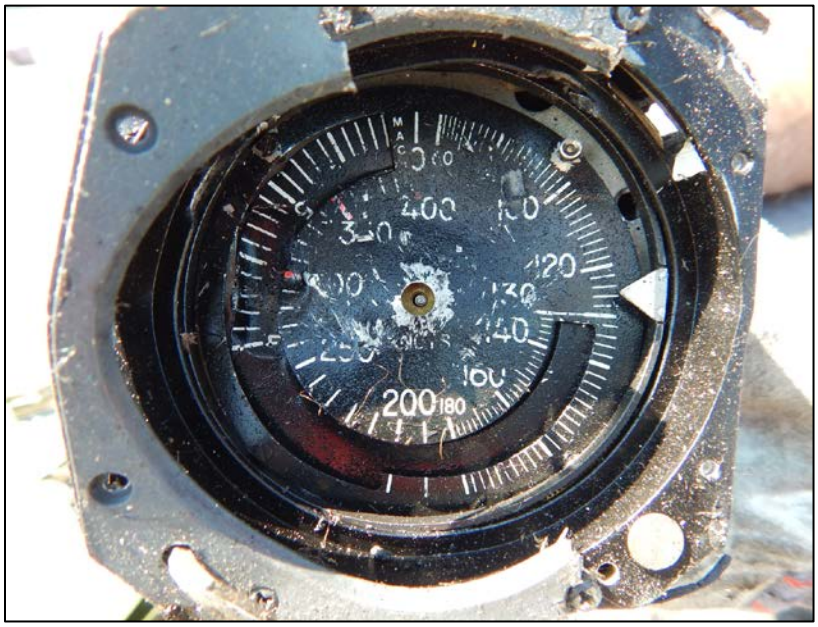

Figure 18: Airspeed indicator

The airspeed indicator landing reference bug was found set to 126 Knots.

Figure 19: Vertical speed indicator

The vertical speed indicator pointer was found indicating a decent rate about 6000-8000 ft. per minute.

Figure 20: Compass

The standby compass was found indicating 210 degrees.

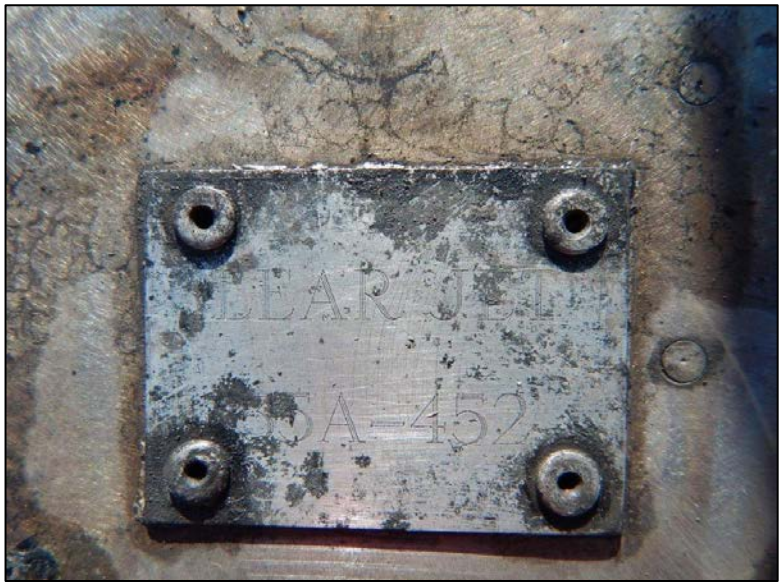

Figure 21: Data Plate

The data plate was found, indicating serial number 35A-452.

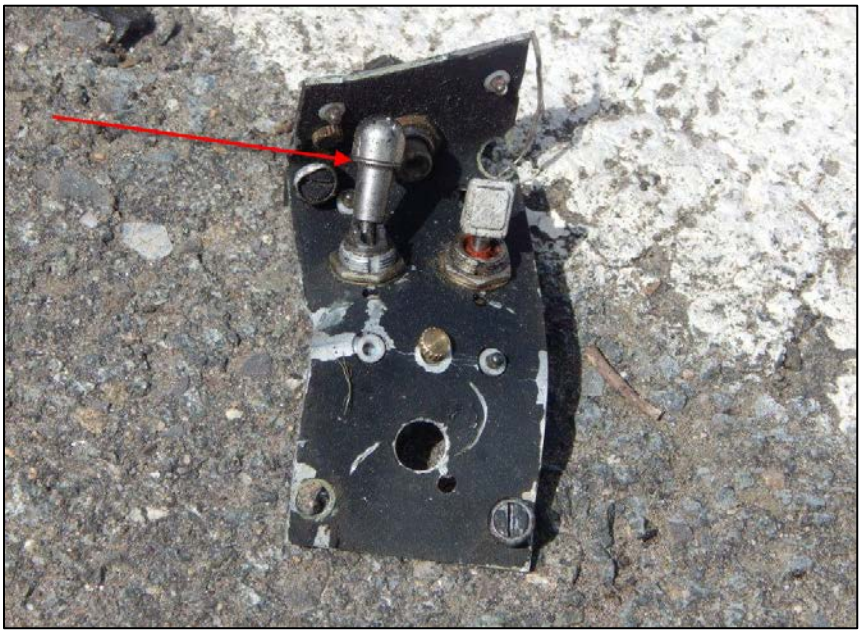

Figure 22: Pitch trim panel switch

The pitch trim panel switch was found set in the primary position.

Figure 23: Autopilot Faceplate and Pitot Probe

A partial piece of the FC200 autopilot faceplate was located. The pitot probe was also located in the wreckage and separated from its attach point.

5.0 Powerplant Examination

The engine was examined at the accident site. All references to position are aft looking forward. All observations reported are based on visual examinations with the unaided eye, unless otherwise noted.

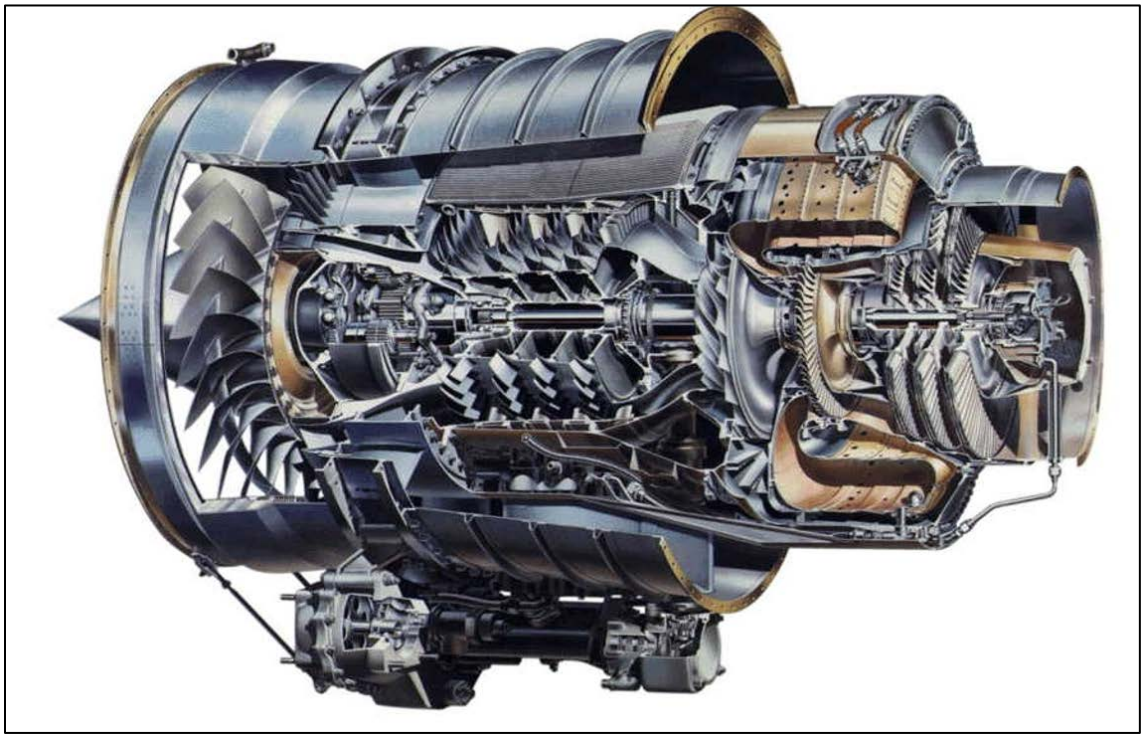

Figure 24: Typical TFE 731-2 Series, Turbofan Engine

Left Engine, TFE731-2-2B, S/N P-89241, Part Number 3070300-9:

The engine was separated into two sections just aft of the engine mainframe at the low pressure compressor (LPC) case attachment split-line. The engine data plate remained attached to the engine inlet housing. The aircraft inlet was separated from the engine inlet housing. The engine inlet housing was partially consumed by the post-crash fire and was impact damaged (compression). The spinner was partially consumed by the post-crash fire. All of the fan blades were present. They exhibited tearing and battering damage and all were bent opposite the direction of rotation. All of the fan blades exhibited heat damage. The #3 bearing and housing were separated from the intermediate case. The ball bearing separator and some of the ball elements were noted in the area around the inlet and fan portion of the engine. The 1st stage LPC blade tip shroud remained with the fan section of the engine.

The accessory gearbox (AGB), transfer gearbox (TGB), fuel control unit (FCU), fuel pump and starter/generator were separated from the engine but remained loosely attached to the mainframe by plumbing and electrical wiring. The engine core (compressor and turbine sections) remained loosely connected to the engine's aircraft aft body and thrust reverser (T/R) by various plumbing lines. The Aeronca type thrust reverser (T/R) appeared to be in the stowed position. The engine core was impact damaged. The 1st and 2nd stage compressor blades exhibited tearing and battering damage and were bent opposite the direction of rotation. The stator vanes were damaged, loose in their mounts and some were missing. The N1 (LPC) was not free to rotate. When viewed through the exhaust, all of the 3rd stage turbine blades and stator vanes appeared to be intact. Both oil caps were present and in place. When the engines were moved during recovery, oil was noted to be draining from the engine fragments.

Left Engine Photos:

Figure 25: Left engine fan assembly

Figure 26: Left engine core with thrust reverser

Figure 27: Left engine low pressure compressor

Figure 28: Left engine accessory gearbox and transfer gearbox

Right Engine, TFE731-2-2B, S/N P-89243, Part Number 3070300-9:

The engine was separated into two sections just aft of the engine mainframe at the low pressure compressor (LPC) case attachment split-line. The engine data plate was found loose in the debris field. The aircraft inlet was separated from the engine inlet housing. The engine inlet housing was mostly consumed by the post-crash fire and was impact damaged. The spinner was separated from the fan assembly. The remaining spinner support bolts were displaced in the opposite direction of rotation. Most of the fan blades were separated from the fan disk. Many of the remaining blades were fractured just outboard of the dovetail attachment blade platforms. The separations were in the direction opposite of the fan rotation. The located separated blades exhibited tearing and battering damage. The #3 bearing and housing remained attached to the engine core.

The accessory gearbox (AGB), transfer gearbox (TGB), fuel control unit (FCU), fuel pump and starter/generator were separated from the engine and were also separated from their respective attachment points. The engine core (compressor and turbine sections) remained within engine's aircraft aft body and thrust reverser. The Aeronca type thrust reverser (T/R) appeared to be in the stowed position. The engine core was impact damaged. The 1st and 2nd stage compressor blades exhibited tearing and battering damage and were bent opposite the direction of rotation. The stator vanes were damaged, loose in their mounts and some were missing. The N1 (LPC) was not free to rotate. When viewed through the exhaust, all of the 3rd stage turbine blades and stator vanes appeared to be intact. Metal spray deposits were adhering to the 3rd stage turbine stator vanes. Both oil caps were present and in place. When the engines were moved during recovery, oil was noted to be draining from the engine fragments.

Right Engine Photos:

Figure 29: Right engine fan assembly

Figure 30: Right engine core with thrust reverser

Figure 31: Right engine low pressure compressor

Figure 32: Right engine accessory gearbox and line replaceable unit

List of Attachments

- Airworthiness - Attachment 1 – Airplane Manufacturer Document Excerpts

Submitted By:

Adam M. Gerhardt