

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



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AIRWORTHINESS

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A. ACCIDENT

Location: Philadelphia, Pennsylvania
Date: January 31, 2025
Time: 1807 eastern standard time
Airplane: Learjet 55, registration XA-UCI

B. AIRWORTHINESS

Group Chair	Ryan Enders National Transportation Safety Board Washington, D.C.
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C. SUMMARY

On January 31, 2025, at 1807 eastern standard time, a Learjet 55 airplane, Mexican registration XA-UCI (call sign MTS056) was destroyed when it was involved in an accident in Philadelphia, Pennsylvania. The two pilots, two medical crewmembers, and two passengers were fatally injured. One person on the ground was fatally injured, 4 people were seriously injured, and 20 people incurred minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 129 air ambulance flight.

D. DETAILS OF THE INVESTIGATION

1.0 Flight Information

ADS-B flight track data obtained from the Federal Aviation Administration revealed that the flight departed runway 24 at Northeast Philadelphia Airport (PNE), Philadelphia, Pennsylvania, about 1806, with the intended destination of Springfield-Branson National Airport (SGF), Springfield, Missouri. The airplane continued in the

left turn and reached an altitude of 1,650 ft mean sea level (airport elevation was 119 ft). The track data ended at 1807, at 1,275 ft msl, and at 242 knots ground speed. The duration of the flight was about 1 minute.¹

A vehicle dash mounted camera near the airport captured the airplane shortly after departing the runway, and the landing light extinguished which indicated the landing gear was retracted.²

A doorbell camera mounted at a private residence near the airport captured the engine audio as the airplane passed by. The video captured the sound of the explosion after about 1 minute of audio.³

Several cameras around the accident location captured the airplane's decent and impact. No trailing smoke or visible fire was observed in the videos examined. The airplane was in a left wing low, nose down orientation, and fully intact in the final seconds of the flight sequence.⁴ The landing gear was retracted.

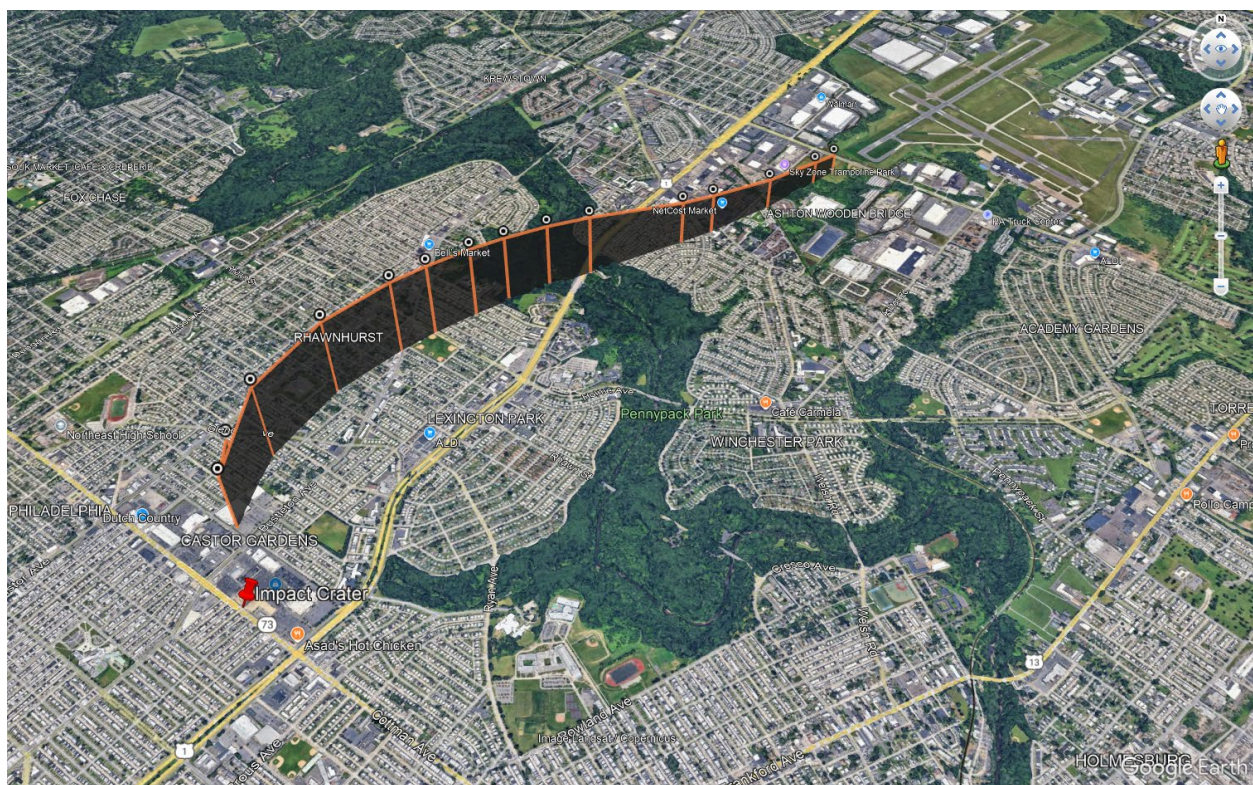


Figure 1: Accident Flight Path with the Impact Crater Location Marked

¹ Airworthiness Attachment 3- Flight Path

² Airworthiness Attachment 4- Dash Camera Video

³ Airworthiness Attachment 5- Audio of Takeoff

⁴ Airworthiness Attachment 6- Drive Thru Video

2.0 Accident Site

The main wreckage debris field was located between the intersections of Hanford St. at Cottman Ave. and Roosevelt Blvd. and the wreckage debris field was about 1,410 ft in length and 840 ft wide, oriented on a magnetic heading of about 150°. The airplane horizontal stabilizer contacted a business sign beside the main impact crater and the calculated descent angle based on the height of the observed damage to the sign was about 22°. White paint transfer was evident at the point of contact with the sign.

Several medical oxygen bottles were located furthest from the impact crater on the opposite side of Roosevelt Blvd. Multiple cars on Cottman Ave. were burned or severely damaged. Several residential and commercial structures along the debris path were damaged or destroyed by fire and airplane debris.

The initial impact crater, measuring about 8 ft deep and 10 ft in diameter, was located centered in a commercial driveway along Cottman Ave., on the northeast sidewalk, between Roosevelt Blvd. and Bustleton Ave. The sidewalk was displaced upwards 3 ft surrounding the impact crater.

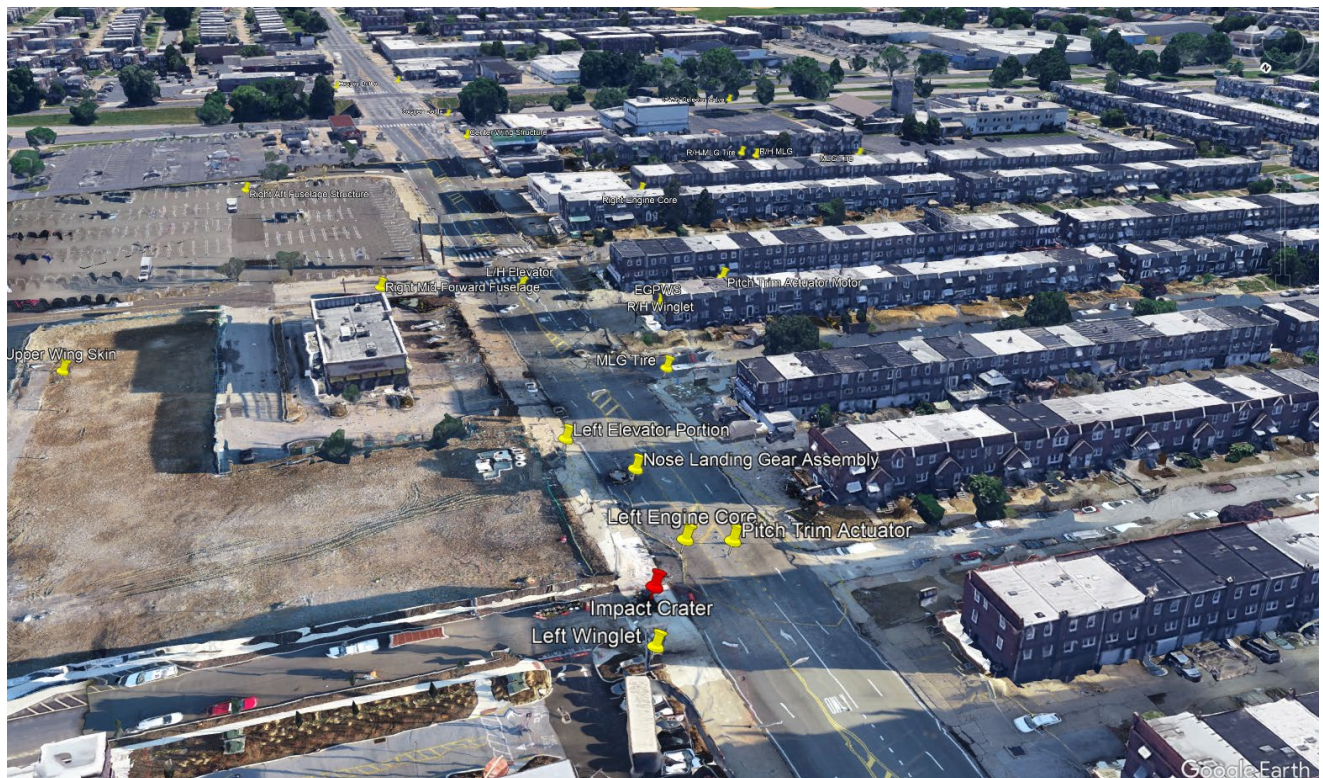


Figure 2: A View of the Debris Path on the 150° Heading with Larger Components Marked. Aerial Imagery of the Accident Site is Overlaid



Figure 3: The First Point of Impact atop a Commercial Sign with the Impact Crater

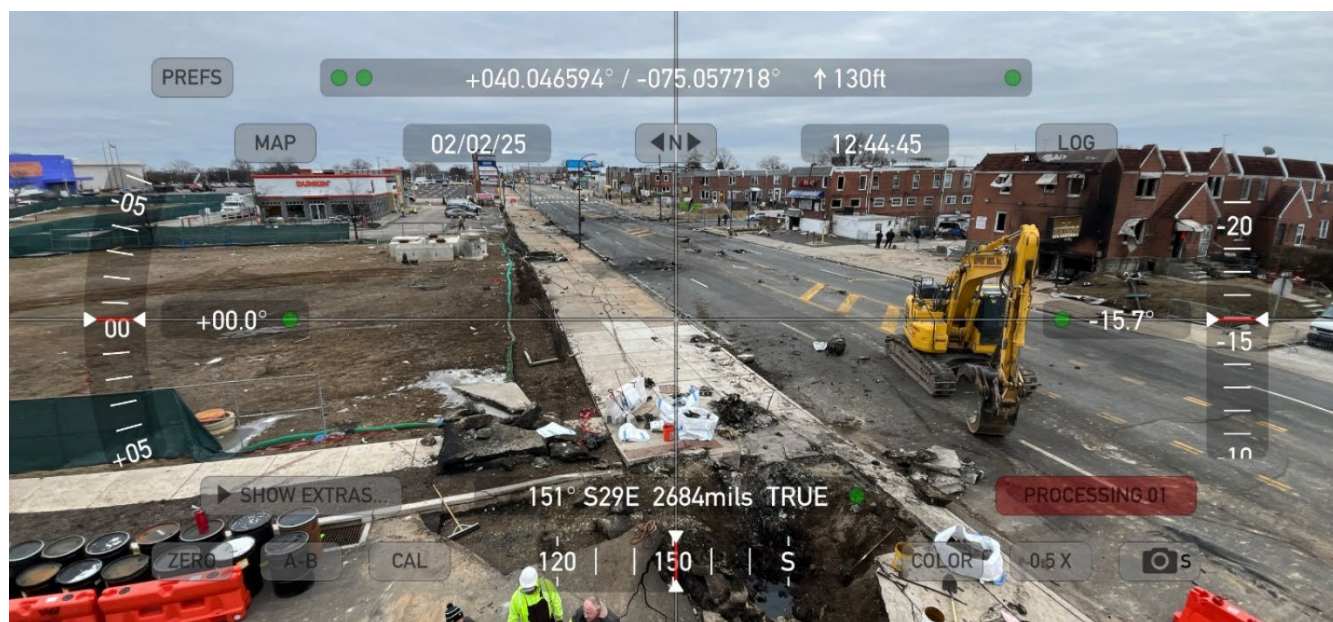


Figure 4: View of the Debris Path as Viewed from the First Point of Impact

3.0 Airplane Information

3.1 Airplane Description

The Mexican registered Learjet 55 airplane (XA-UCI, Serial Number 032) was owned by Air Lease International Corporation (Avenida Americas No. 1930, Piso 15, Interior 6, De La Torre C&C, Col. Lomas Del Country, Guadalajara, Jalisco) and operated by Med Jets, S.A. De C.V. (Loma Bonita No. 1893, Col. Independencia, C. P. 44240 Guadalajara, Jalisco.). The Mexican Airworthiness Certificate of the airplane showed an issue date of June 10, 2023, and an expiration date of April 10, 2025.

3.2 Accident Airplane History

The accident airplane was built by Bombardier (Learjet) on March 31, 1982, registered in the United States and delivered to the operator (Tesoro Petroleum Co Inc) on June 15, 1982. The accident airplane was owned, operated, and sold several times until it was sold and exported to Mexico on August 15, 2014 (Federal Aviation Administration deregistered the airplane). According to the Med Jets maintenance records, at the time of the accident, the airplane had accumulated 17,068.651 hours and 9,934 cycles.

On the day prior to the accident flight, the airplane was situated on the ramp of a fixed based operator (FBO) at Opa-Locka Executive Airport (OPF), Opa Locka, Florida. Surveillance video obtained from the FBO shows 2 individuals in a van arriving to the airplane. The individuals were noted around and in the airplane for about 1 total hour between the hours of 2200 and 2300 local time. The operator was asked what maintenance was performed on the airplane during that time. The operator stated that there was no work completed on the airplane at that time and that there were no reports available to suggest that any maintenance had been completed at that time. When asked to identify the individuals seen in the video, the company was unable to provide that information. The airplane departed from OPF on January 31, 2025, at about 1200 and arrived at the Northeast Philadelphia Airport (PNE), Philadelphia, Pennsylvania at 1416. The airplane refueled with 600 gallons of Jet A fuel and the medical patient was loaded into the airplane prior to departing on the accident flight. The airplane departed PNE enroute for Springfield, Missouri at 1806. Shortly after departing, the airplane impacted terrain at 1807.



Figure 5: Photograph of the Accident Airplane (Courtesy of Operator)

4.0 Airframe Examination

4.1 On-Scene

Three investigators from Bombardier, two investigators from Honeywell, and an investigator from the FAA were present for the on-scene examination of the airplane. The airplane key components were documented via GPS coordinates and plotted onto drone imagery provided by the NTSB drone support team. The airplane was destroyed during the impact sequence.

A complete list of the location of components can be found in the Airworthiness Group Chairman's Factual Report- Attachment 1⁵. The left winglet was found just prior to the impact crater. Debris was dispersed outward and widened along the debris path with the main wreckage field extended to about 1,100 ft. Oxygen bottles and portions of the oxygen bottle regulators stretched beyond the main debris field. Within the impact crater, the following key components were documented at various depths: the cockpit voice recorder, the left thrust reverser assembly, portions of the vertical stabilizer assembly, a portion of the rudder trim tab, auto pilot roll servo, air conditioning motor, an autopilot servo for the pitch or yaw,

⁵ Airworthiness Attachment 1- On-Scene

airplane drag chute (not deployed), portion of the keel beam, and the underwater locator beacon.

Both engines were separated from the empennage and located within the main debris field. Four major sections of the engine hardware were located within the debris field. The left engine core was located and identified 30 ft from the impact crater. The right engine core was located and identified 665 ft from the impact crater in a second-floor residential bedroom. The left fan assembly was located 560 ft from the impact crater under a car on Rupert St. and the right fan assembly was located 785 ft from the impact crater at the base of an overhead billboard on top of a single-story commercial structure. Numerous other pieces of both engines were located throughout the debris field.

The wreckage was bagged and removed from the scene for secured storage. The bags of wreckage were labeled based on their approximate location for where they were filled⁶.



Figure 6: Impact Point and Debris Location with Aerial Photography Overlay. The Debris Path was 1410 ft in Length and 840 ft in Width

⁶ Airworthiness Attachment 2- Wreckage Layout



Figure 7: Impact Crater Prior to Debris Removal



Figure 8: Impact Crater with Most Debris Removed

4.2 Post-Recovery Wreckage Examination

The collected bags of wreckage debris were evaluated individually and their large components contained within them were documented.⁷ During the wreckage examination, there was no evidence of preaccident mechanical malfunctions or failures with the airplane that would have precluded normal operation.

Several control cables were found throughout the debris field and during the wreckage examinations. The control cables were all damaged by impact forces and displayed overload signatures at their respective breaking points. Control cable continuity from the cockpit to the respective control surfaces could not be confirmed due to the damage the airplane sustained during the accident sequence.



Figure 9: Bag 23 Contents as an Example of Wreckage Debris Collection. The Bag Photographs and a List of Contents Can be Found in the Airworthiness Chairman's Factual Report - Attachment 2

⁷ Airworthiness Attachment 2- Wreckage Layout



Figure 10: Control Cables Extending From the Cockpit Debris



Figure 11: Miscellaneous Control Cables and Pulleys

4.3 Fuselage

Portions of the fuselage were found throughout the recovery bags. Larger portions of the fuselage structure included a portion of the right fuselage, a section with the emergency egress door, a section with three cabin windows, the right hand pilot side window and windshield, a portion of the top fuselage corresponding to the three cabin window fragment, a section of the left side forward cabin window, and other various portions of fuselage exterior structure. The larger portions of the fuselage were laid out in their corresponding locations and documented.



Figure 12: Layout of the Largest Fuselage Structure Components and Remaining Wing Fragments

4.4 Cockpit and Cabin

The airplane was equipped with a pilot and co-pilot seat, two cabin crew seats, and three passenger seats. A patient bed was attached to the right side cabin interior with seating on the left side and aft portions of the cabin interior.

The back portion of a pilot seat was located but could not be identified as pilot or co-pilot. Two passenger bottom seats, and several medical bags from the interior of the airplane were evaluated. None of the seat portions or canvas medical bags displayed signs of sooting.

Various portions of the cockpit were found throughout the debris field and various recovery bags. On scene, the cockpit instrumentation and seats were found

primarily in the center of the debris field along the debris heading. The cockpit instrumentation and controls that were found were isolated and photographed collectively. Avionics and other electronic equipment were also isolated and evaluated. Of the evaluated electronics, no data was recovered from the accident flight.

Medical equipment and various interior components were observed throughout the scene and found within the recovery bags. The larger pieces were identified and noted.⁸ According to the accident flight weight and balance documentation obtained from the operator, the airplane was holding 350 lbs of baggage in the empennage baggage compartment.

A large section of electrical wiring harness was located on Cottman Ave. and was partially wrapped around a passenger vehicle. The bundle was recovered and examined with no discrepancies noted.



Figure 13: Interior of the Accident Airplane Displaying the Configuration (Courtesy of Operator)

⁸ Airworthiness Attachment 2- Wreckage Layout



Figure 14: Additional Interior of the Accident Airplane Displaying the Configuration (Courtesy of Operator)

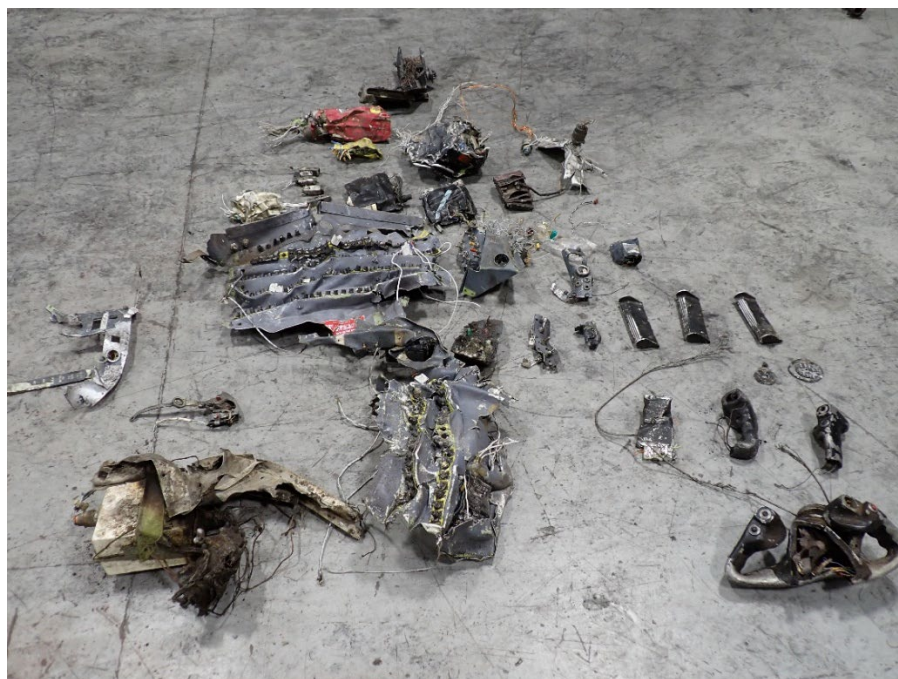


Figure 15: Cockpit Instrumentation, Circuit Breakers, and Controls



Figure 16: Cockpit Instrumentation, Circuit Breakers, and Controls



Figure 17: Collection of Miscellaneous Electronic Equipment Recovered



Figure 18: Collection of Miscellaneous Electronic Equipment Recovered



Figure 19: Collection of Miscellaneous Electronic Equipment Recovered



Figure 20: Collection of Miscellaneous Electronic Equipment Recovered



Figure 21: Cabin Seating and Miscellaneous Medical Supplies Absent of Sooting



Figure 22: Large Wiring Harness and Bundles as Recovered

4.5 Empennage

On-scene, portions of the empennage were noted primarily at the impact crater and near the beginning of the debris field⁹. Portions of the empennage found in the impact crater included the cockpit voice recorder (CVR), a portion of the aft fuselage below the tail cone structure, a portion of the vertical stabilizer structure, faceplates for the electronic engine controls (EEC's), a portion of the rudder with the trim tab, autopilot roll servo, the un-deployed drag chute, and a portion of the keel beam. Post recovery, portions of the empennage were documented in various recovery bags.

⁹ Airworthiness Attachment 1- On-Scene



Figure 23: Lower Tail Section with Attached Control Cables



Figure 24: Portion of the Left Horizontal Stabilizer and Elevator

4.6 Wings

On-scene, the left winglet was found prior to the impact crater, near the first point of contact. The right winglet was found about 350 ft from the impact crater on the southern side of Cottman Ave., in an alleyway. Wing skin was found throughout

the debris field, but right-wing skin was concentrated near the beginning of the debris field on the southern side of Cottman Ave. A portion of the center wing structure was found about 920 ft from the impact crater along the debris path heading on Cottman Ave.

A large portion of the right wing was recovered. Post recovery, the right-hand wing was placed on a table upside down. The access panels for the right-hand flap actuator were removed. The actuator was verified to be connected at the sector and the mounting lug. The flap interconnect cable was still attached to the flap sector. The hydraulic lines were still attached to the actuator. The spoiler actuator remained in place and undamaged and remained connected to the spoiler. An aileron control cable was observed running through the wing.



Figure 25: Fragments of the Left Wing Structure



Figure 26: Large Section of the Right Wing



Figure 27: Right Wing and Right Flap



Figure 28: Right Wing Spar

4.7 Landing Gear

On-scene, the right main landing gear assembly and tire were found about 830ft beyond the impact crater. The tire had punctured the second floor structure of a residential property and came to rest within that bedroom. The remainder of the landing gear assembly was outside of that residential property near the street. The left main landing gear was found about 550 ft away from the impact crater on a sidewalk adjacent to Rupert St. The nose landing gear and tires were found near the impact crater and were wedged underneath a vehicle on the northern travel lane of Cottman Ave. Post recovery, the landing gear components were organized with all major components accounted for. Based on video surveillance of the accident, all

three landing gears (nose, left and right main gears) were in the “up” position at the time of the accident.



Figure 29: Pieces of the Landing Gear

4.8 Fuel/Fuel System

Fuel receipts obtained from the FBO at the Philadelphia Northeast Airport (PNE), Philadelphia, Pennsylvania prior to the accident indicate that the crew received 600 gallons of Jet-A on January 31, 2025. The 600 gallons of fuel would equate to 4,020 lbs of fuel received from the FBO prior to departure.

The weight and balance sheet obtained from the operator of the accident airplane for the accident flight indicated that the airplane had 6,100 lbs of fuel total onboard prior to departing on the accident flight. The expected fuel burn from the weight and balance sheet indicated 4,000 lbs. The airplane was capable of holding a total of 6,707 lbs of fuel, according to the same weight and balance sheet.

On-scene, visible jet fuel and the smell of fuel was present throughout the debris field. A significant explosion from the airplane was captured on surveillance video of the accident events.



Figure 30: Exterior Fueling Control Panel

4.9 Other Systems Examined

The cockpit voice recorder (CVR) was found within the impact crater and exhibited impact damage. The CVR was sent to the NTSB recorders laboratory for data extraction. It was opened and the tape within the unit was soaked in a combination of fuel and water that required cleaning and drying prior to readout. The recording tape was spliced and repaired in various locations. The CVR did not record the accident flight and was inoperative for several years. Reference the Cockpit Voice Recorder Specialists Report. According to the DAAIA, based on the age of the airplane, it was not required to be equipped with a CVR. According to the Mexican regulations and mandatory circular CO V-022/22 R2, the installed CVR was not required to be operationally checked. The operator of the airplane followed the manufacturers maintenance program which called for inspection of the locator beacon and the associated battery. The engine start checklist for the airplane required and operational test of the CVR, but it is likely that this test was failing and was ignored by the flight crew as a result of the CVR not being required. It is unknown if the CVR was placarded inoperative due to extensive damage sustained during the accident sequence.

The pitch trim motor and actuator were sent to the manufacturer for measurement and disassembly. The pitch trim actuator consisted of a jackscrew assembly and two motors. The primary motor was recovered but the secondary motor was not present during the examination. The secondary motor was later recovered within the wreckage and was damaged by impact forces. The actuator

remained connected to the gear box, but the actuator was jammed from impact forces. Portions of airplane structure remained attached to the mounting surfaces and were removed to facilitate the investigation. The jackscrew would turn but turning it did not change the extension of the assembly. An attempt to check for free play in actuator extension was not possible because of the screw being jammed by impact damage. The pitch trim assembly was installed into the manufacturers test fixture, and the calibration of the fixture was verified. According to the manufacturer, a fully extended (nose down pitch) measurement is 18.77 ± 0.030 inches. A fully retracted (nose up pitch) would measure 13.87 ± 0.030 inches. The pitch trim actuator was measured at 17.3141 inches; according to the manufacturer, this equates to 3.97 trim units on the cockpit pitch trim indicator, where 1 is full nose down trim and 11 is full nose up trim. The take-off trim 'green' band is between 4 and 8 units of trim. A compression load and a tension load of about 100 lbs was applied to the pitch trim assembly which revealed no sign of the internal threads of the jackscrew being stripped. The screw and screw dust cover were bent from impact forces which required destructive disassembly to evaluate the screw thread condition. Once disassembled, the screw threads were found intact with no overload signatures and no stripped threads observed. The actuator gear box was disassembled and there were no broken gear teeth or signs of overload or jamming. Based on the measurements obtained and physical observations during the actuator disassembly, it was concluded that the measured extension of the actuator was the extension immediately prior to impact. Checklists found in the wreckage indicate that with the 16.85% MAC, noted on the accident flight weight and balance provided by the operator, the takeoff pitch trim should have been set to 5.6° . The motors were not disassembled.

The right flap actuator remained contained within the right wing and the access panel was opened to access it. The right actuator was verified to be connected at the sector and the mounting lug. The hydraulic lines were still attached to the actuator. The flap actuator was removed from the wing but during the removal the actuator piston was pulled/extended about 1-1 1/2 ". The righthand flap actuator measurement, post pull, was 19" equating to full extension. Prior to the movement, it would have been about 17 1/2 - 18". 17 1/2 corresponds to 30 degrees of flap, which was determined to not be a standard flap setting position. The left-hand flap actuator was impact separated and found within a recovery bag during a wreckage examination. The left-hand flap actuator was measured at about 13 1/4" corresponding to about 2 degrees of flap (retracted). The piston was jammed and could not be moved by hand and indicated, per the Learjet standard flap settings for takeoff, this was likely the flap setting at the time of the accident. The right and left flap actuators were scanned using computed tomography (CT) to document the position and condition of the internal components. Reference the Computed Tomography Specialists factual report.

The Enhanced Ground Proximity Warning Systems (EGPWS) was recovered from the wreckage and sent to the manufacturer for evaluation. The unit exhibited crush damage as a result of the impact. The flash chip that contained the flight history

was cracked completely across the chip in two locations. A microscope inspection showed cracking that ran along the ground plane that contained the die. Bond wires were severed. X-ray images of the ground plane show that it was intact. As a result of the damage to the chip, the data was not able to be recovered from the EGPWS.



Figure 31: CVR Post Removal from the Impact Crater with Exterior Damage



Figure 32: Pitch Trim Actuator in the Manufacturer's Test Bench



Figure 33: Pitch Trim Actuator Displaying Bending and Fracture to the Screw Assembly

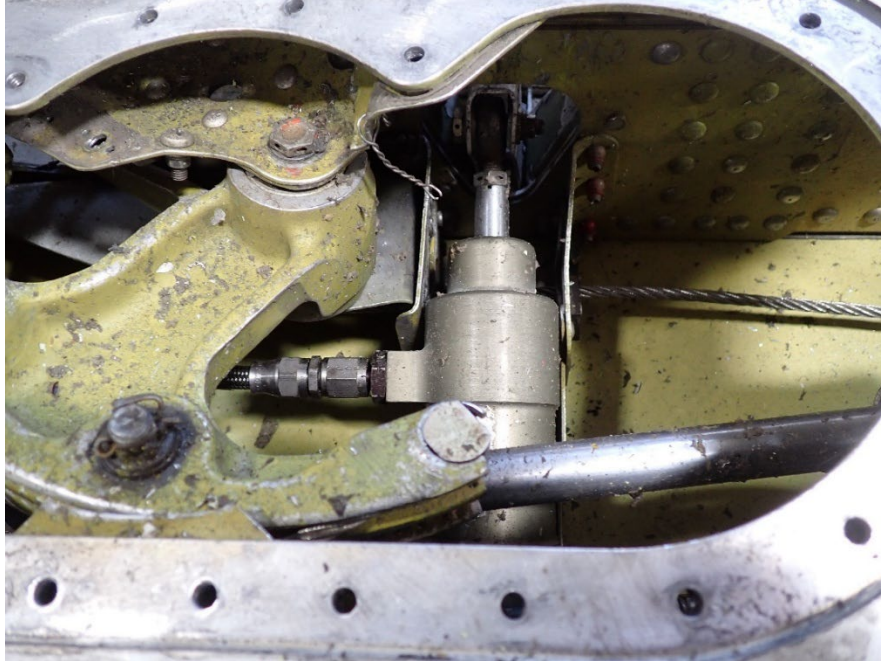


Figure 34: Right Wing Flap Actuator as Found in the Right Wing



Figure 35: Left and Right Flap Actuators



Figure 36: Secondary Pitch Trim Motor Found within the Debris

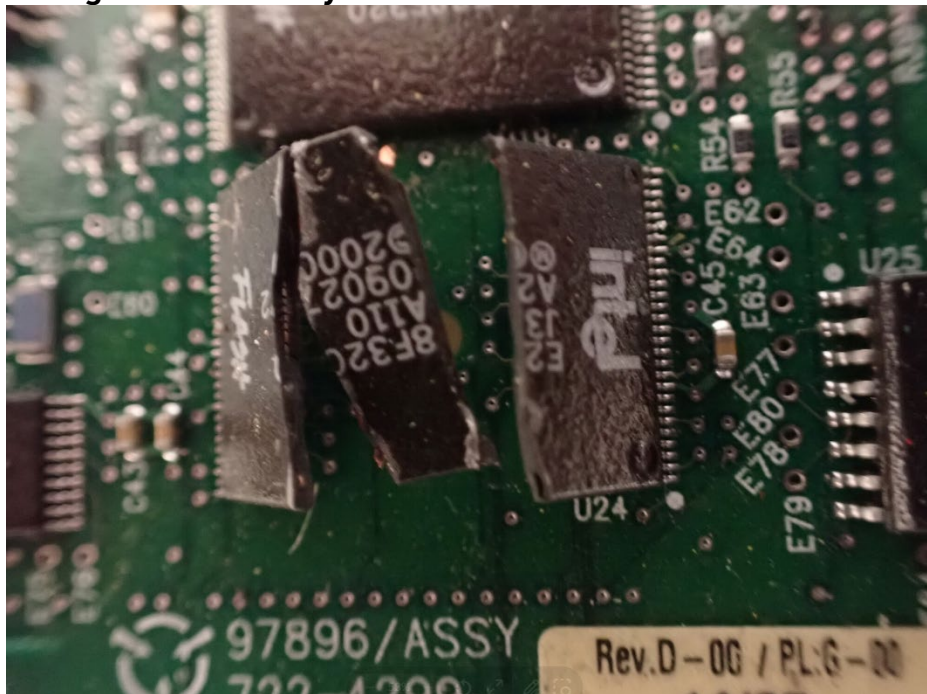


Figure 37: The flash chip of the EGPWS that contained the flight history was cracked completely across the chip in two locations

5.0 Engine Examination

Both engines were examined to confirm their respective locations on the airplane. The engines were identified based on the physical damage to the aft engine mounts and the serial numbers of a fan disk and a first stage compressor disk. A borescope inspection was completed on both engines showing that the 1st stage of the low pressure (LP) turbine was present. Visual inspection of both engine cores did not reveal any preimpact mechanical malfunctions or failures that would have precluded normal engine operation.

A sound spectrum analysis was conducted by Honeywell engineering. The Doppler correction process was applied to the extracted 5, 6, 7, and 9-per-rev tone traces to produce estimates of the fan speed as a function of absolute time. The final results estimated source emission frequencies at the estimated source emission times, corresponded to each time-frequency pair that was extracted from the spectrogram. The time period of estimated source frequencies covers roughly four seconds, with the data ending approximately 2 seconds prior to impact. There appeared to be a slight increase in speed over time, but it is unknown whether this is genuine or an artifact of uncertainties in the computation procedure. The data extracted for the different n-per-rev traces are consistent with one another, lends credence to that these are fan buzzsaw generated tones. The estimated average engine fan speed over the four seconds just prior to impact was approximately 10,900 rpm. This is consistent with the engines operating at full takeoff power. The ambient conditions and flight speeds used in the engine performance model with embedded engine control logic are representative of the conditions during the accident flight from takeoff to just prior to impact and provide the fan speeds at takeoff and maximum climb power setting. The data represented that both engines were operating at takeoff power at the time of the accident.

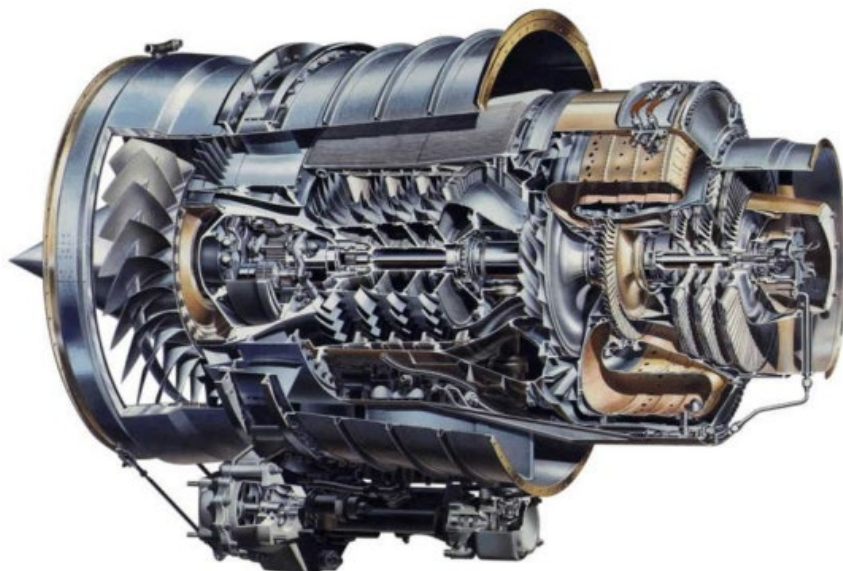


Figure 38: Typical TFE731-3 Series Turbofan Engine (Courtesy of Honeywell)



Figure 39: One of the Engine Mounts

5.1 Right Engine

The right engine was found in the second-floor residential bedroom. The 9 o'clock aft engine mount bolt hole was torn outwards, indicating that the engine was mounted in the number 2 position, which is the right side. Through aircraft airworthiness documentation, this engine is identified as P-85139C.



Figure 40: Right Engine Core as Found on the Second Floor of a Residential Structure

5.2 Left Engine

The left engine was found in the street near the impact crater and was identified by the engine aft mount damage and from a partial serial number on the first stage compressor disk. The fan assembly under the car had serial number markings with four digits of the fan disk serial number reading "1860". Per engine build book for engine serial number P-85243, the serial number of the fan disk was 970322901860. From the airplane airworthiness documentation, it was determined that engine serial number P-85243 was in position 1, which is the left engine. The 3 o'clock aft engine mount bolt hole was torn outward, indicating that it was the left engine. The inter-turbine temperature (ITT) harness was routed on the right side of the engine to go to the lefthand engine pylon. The first stage compressor disk, part number was identified as 3072395-1 with serial number 1-12112-1548. Per the engine build log, the serial number was 1- 12112-1548.



Figure 41: Left Engine Core as Found Adjacent to the Impact Crater

6.0 Maintenance

Maintenance records were obtained from the operator and reviewed by the Maintenance Group. Historical Logbooks were reviewed dating back to manufacturer of the accident airplane up to logbook dated January 2, 2025. The logbooks were from previous/current owners/operators of the accident airplane. The group attempted to review destroyed documents recovered from the accident airplane.

It could not be determined if there were any maintenance issues on the airplane prior to the airplane flight. A weight and balance document for the accident flight was provided by the operator and at the time of the accident, the airplane had accumulated 17,078.2 hours and 9,936 cycles. Reference the Maintenance Group Chairman's Factual Report.

7.0 Hazardous Materials Examination

A NTSB Hazardous Materials Group was formed to evaluate the compressed gas cylinders that were carried aboard the airplane. A total of 8 compressed gas cylinders were recovered from the wreckage. Additionally, 3 halon bottles were recovered. There was no evidence of a catastrophic failure inflight from any of the compressed gas cylinders recovered. Reference the Hazardous Material Group Chairman's Factual report.

Submitted by:

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