Aviation Investigation Final Report

Location:	Fort Lauderdale, Florida	**Accident Number:**	ERA14FA045
Date & Time:	November 19, 2013, 19:56 Local	**Registration:**	XA-USD
Aircraft:	Learjet 35	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

During takeoff to the east over the ocean, after the twin-engine jet climbed straight ahead to about 2,200 ft and 200 knots groundspeed, the copilot requested radar vectors back to the departure airport due to an "engine failure." The controller assigned an altitude and heading, and the copilot replied, "not possible," and requested a 180-degree turn back to the airport, which the controller acknowledged and approved. However, the airplane continued a gradual left turn to the north as it slowed and descended. The copilot subsequently declared a "mayday" and again requested vectors back to the departure airport. During the next 3 minutes, the copilot requested, received, and acknowledged multiple instructions from the controller to turn left to the southwest to return to the airport. However, the airplane continued its slow left turn and descent to the north. The airplane slowed to 140 knots and descended to 900 ft as it flew northbound, parallel to the shoreline, and away from the airport. Eventually, the airplane tracked in the direction of the airport, but it continued to descend and impacted the ocean about 1 mile offshore.

According to conversations recorded on the airplane's cockpit voice recorder (CVR), no checklists were called for, offered, or used by either flight crewmember during normal operations (before or during engine start, taxi, and takeoff) or following the announced in-flight emergency. After the "engine failure" was declared to the air traffic controller, the pilot asked the copilot for unspecified "help" because he did not "know what's going on," and he could not identify the emergency or direct the copilot in any way with regard to managing or responding to the emergency. At no time did the copilot identify or verify a specific emergency or malfunction, and he did not provide any guidance or assistance to the pilot.

Examination of the recovered wreckage revealed damage to the left engine's thrust reverser components, including separation of the lower blocker door, and the stretched filament of the left engine's thrust reverser "UNLOCK" status light, which indicated that the light bulb was illuminated at the time of the airplane's impact. Such evidence demonstrated that the left engine's thrust reverser became unlocked and deployed (at least partially and possibly fully) in flight. Impact damage precluded testing for electrical, pneumatic, and mechanical continuity of the thrust reverser system, and the reason the left thrust

reverser deployed in flight could not be determined. No previous instances of the inflight deployment of a thrust reverser on this make and model airplane have been documented.

The airplane's flight manual supplement for the thrust reverser system contained emergency procedures for responding to the inadvertent deployment of a thrust reverser during takeoff. For a deployment occurring above V1 (takeoff safety speed), the procedure included maintaining control of the airplane, placing the thrust reverser rocker switch in the "EMER STOW" position, performing an engine shutdown, and then performing a single-engine landing. Based on the wreckage evidence and data recovered from the left engine's digital electronic engine control (DEEC), the thrust reverser rocker switch was not placed in the "EMER STOW" position, and the left engine was not shut down. The DEEC data showed a reduction in N1 about 100 seconds after takeoff followed by a rise in N1 about 35 seconds later. The data were consistent with the thrust reverser deploying in flight (resulting in the reduction in N1) followed by the inflight separation of the lower blocker door (resulting in the rise in N1 as some direct exhaust flow was restored). Further, the DEEC data revealed full engine power application throughout the flight. Although neither flight crewmember recognized that the problem was an inflight deployment of the left thrust reverser, certification flight test data indicated that the airplane would have been controllable as it was configured on the accident flight. If the crew had applied the "engine failure" emergency procedure (the perceived problem that the copilot reported to the air traffic controller), the airplane would have been more easily controlled and could have been successfully landed.

The airplane required two fully-qualified flight crewmembers; however, the copilot was not qualified to act as second-in-command on the airplane, and he provided no meaningful assistance to the pilot in handling the emergency. Further, although the pilot's records indicated considerable experience in similar model airplanes, the pilot's performance during the flight was highly deficient. Based on the CVR transcript, the pilot did not adhere to industry best practices involving the execution of checklists during normal operations, was unprepared to identify and handle the emergency, did not refer to the appropriate procedures checklists to properly configure and control the airplane once a problem was detected, and did not direct the copilot to the appropriate checklists.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain control of the airplane following an inflight deployment of the left engine thrust reverser. Contributing to the accident was the flight crew's failure to perform the appropriate emergency procedures, the copilot's lack of qualification and capability to act as a required flight crewmember for the flight, and the inflight deployment of the left engine thrust reverser for reasons that could not be determined through postaccident investigation.

Findings

Personnel issues	Lack of action - Flight crew
Personnel issues	Aircraft control - Flight crew
Aircraft	(general) - Not attained/maintained
Personnel issues	Use of checklist - Pilot
Personnel issues	Qualification/certification - Copilot
Aircraft	Thrust reverser - Malfunction

Factual Information

History of Flight

Initial climb	Powerplant sys/comp malf/fail
Initial climb	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On November 19, 2013, at 1956 eastern standard time, a Learjet 35A, Mexican registry XA-USD, operated by Aero JL SA de CV, was destroyed when it collided with the Atlantic Ocean following a loss of control while returning for landing after takeoff from Fort Lauderdale/Hollywood International Airport (FLL), Fort Lauderdale, Florida. The commercial pilot and a physician on board were lost and presumed fatally injured. The copilot and a flight nurse were fatally injured. Night visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan was filed for the positioning flight, which was conducted under the provisions of Title 14 Code of Federal Regulations Part 91.

The airplane had just completed an air ambulance flight for Air Evac International from San Jose, Costa Rica to FLL, and was repositioning back to its base in Cozumel, Mexico.

Voice and radar information from the Federal Aviation Administration (FAA) revealed the airplane departed runway 10 at FLL about 1950 and climbed straight ahead. When the airplane reached an altitude of about 2,200 feet and a groundspeed of 200 knots, the copilot requested radar vectors from air traffic control (ATC) to get back to the runway due to an "engine failure." The controller directed the flight to maintain 4,000 feet and turn to a heading of 340 degrees. The copilot replied, "Not possible" and requested a 180-degree turn back to the airport. The controller acknowledged, but the airplane continued a gradual turn to the north as it slowed and descended.

At 1952:34, the copilot declared a "mayday" and again requested vectors back to FLL. During the next 3 minutes, the copilot requested vectors to the airport multiple times. While the copilot requested, received and acknowledged increasingly sharper and tighter turns to the southwest from ATC to return to the airport, the airplane continued its slow turn and descent to the north. During the 2 minutes following the copilot's declared intention to return to FLL, the airplane descended to 900 feet and slowed to 140 knots as it flew northbound, parallel to the shoreline and away from FLL. At 1955:15, the copilot reported the airplane was "…two hundred feet over the sea." After that, there were no intelligible transmissions received from the airplane, and communications with the airplane were lost.

According to conversations recorded on the airplane's cockpit voice recorder (CVR), no checklists were called for, offered, or used by either crewmember during normal operations (before or during engine start, taxi, takeoff) or following the announced in-flight emergency. There were no challenge-and-response checklist callouts between the pilot and copilot at any time during the flight, no elements of crew coordination, and no identification of the emergency. After the "engine failure" was declared to ATC, neither crewmember asked for or offered the "Engine Failure" checklist, nor was there any attempt to complete an emergency procedure and then ask for a checklist verification of actions taken. The pilot asked the copilot for unspecified "help" because he did not "know what's going on" and he could not

identify the emergency or direct the copilot in any way with regard to managing or responding to the emergency. At no time did the copilot identify or verify a specific emergency or malfunction, and he did not provide any guidance or assistance to the pilot.

Pilot Information

Certificate:	Commercial	**Age:**	62
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Unknown	**Last FAA Medical Exam:**	
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 10091 hours (Total, all aircraft), 1400 hours (Total, this make and model)		

Co-pilot Information

Certificate:	Commercial; Private	**Age:**	26
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Unknown	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	206 hours (Total, all aircraft), 29 hours (Total, this make and model)		

Both pilots were employed by Vuela SA de CV, which was an independent company that "leased" the pilots to Aero JL SA de CV. Both companies were owned and operated by the same individuals.

The pilot was issued a commercial pilot certificate by the government of Mexico, with ratings for airplane single-engine, airplane multiengine land, and instrument airplane. The Mexican Government issued his most recent medical certificate on August 22, 2013. According to the operator, the pilot had accrued 10,091 total hours of flight experience, of which 1,400 hours were in the 30-series Learjet.

On July 5, 2013, the operator issued the pilot a certificate of training for 8 hours of crew resource management. On the same day, he was issued another certificate for an additional 8 hours of instruction on controlled flight into terrain.
The copilot was issued a commercial pilot certificate by the government of Mexico, with ratings for airplane single-engine, airplane multiengine land, and instrument airplane. His most recent Mexican medical certificate was issued June 26, 2013. The copilot's total flight experience could not be

reconciled. Documents provided by the operator suggested the copilot had accrued an estimated 1,243 total hours of flight experience, of which 29 hours were in the accident airplane make and model.

According to company records and a resume, the copilot began flying Learjet airplanes for the Vuela SA/Aero JL organizations on May 1, 2013. At that time, the copilot declared 1,206 total hours of flight experience of which 82 hours were "observer" time in Learjet 25 airplanes. From the day of employment to the day of the accident, the copilot accrued 37.16 hours of flight experience in Lear 25/35 airplanes.

A certificate stamped "General Technical Department of Licenses", which was forwarded by the operator, suggested the copilot accrued 175 hours in the Learjet 35A between July 4, 2013, and October 30, 2013; however, his total documented flight experience increased only 29 hours over the same time period.

Documents examined revealed only academic instruction for the copilot's commercial pilot certificate, and specifically, the Learjet 25/35 airplanes. On August 20, 2012, the copilot received a diploma for classroom instruction received for the Learjet 20 series airplanes from a technical training school in Mexico that had neither airplanes nor flight simulators. There was no evidence that the copilot competed any training or practical tests in a Learjet airplane or flight simulator.

On July 5, 2013, the operator issued the copilot a certificate of training for 8 hours of crew resource management. On the same day, he was issued another certificate for an additional 8 hours of instruction on controlled flight into terrain.

Pay records for the pilot and copilot show identical hours, deductions, and pay over several consecutive pay periods. The pilot and copilot had flown together on three occasions before the accident flight. The accident flight was their first flight together in the United States.

A search of student records by two prominent Learjet training vendors in the United States revealed no records of simulator flight training or attendance by either the pilot or copilot.
The Direction General of Civil Aeronautics (DGAC) for the Government of Mexico examined the pilot and flight training records for both pilots and summarized their findings for this report.

Both the pilot and copilot records showed inconsistencies on the verifications of training and certifications based on the way official government stamps and certifications were displayed over, and with, the entries. They were copies, and did not represent entries properly certified by the Government of Mexico.

Some of the Captain's experience and certifications were based on logbooks never presented.

The copilot's records showed the training for the Learjet 20/30 series airplanes provided and conducted exclusively by the operator, Aero JL.

According to company records, the copilot had accrued 1,243 total hours of flight experience, but there was no "original foreign license and logbook," no "official license certificate" or DGAC file records to support a claim of 1,243 total hours of flight experience.

According to the DGAC, the copilot had actually accrued only 206 total hours of flight experience.

The copilot was evaluated by the DGAC in the airplane on May 2, 2013, and his performance during the practical test was found to be "unsatisfactory."

Aircraft and Owner/Operator Information

Aircraft Make:	Learjet	**Registration:**	XA-USD
Model/Series:	35 A	**Aircraft Category:**	Airplane
Year of Manufacture:	1979	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	255
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	November 4, 2013 Continuous airworthiness	**Certified Max Gross Wt.:**	18300 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:	6842 Hrs as of last inspection	**Engine Manufacturer:**	Honeywell
ELT:	C126 installed, not activated	**Engine Model/Series:**	TFE731-2
Registered Owner:	Aero JL SA de CV	**Rated Power:**	3500 Lbs thrust
Operator:	AIR EVAC INTERNATIONAL	**Operating Certificate(s) Held:**	None

General
The Learjet 35A was a 6- to 8-passenger business jet powered by two Garrett (Honeywell) TFE731-2 turbofan engines. According to the Airplane Flight Manual (AFM), "The minimum flight crew shall consist of pilot and copilot."

According to FAA and maintenance records, the airplane was manufactured in 1979. Its most recent continuous airworthiness inspection was completed November 4, 2013, at 6,842 aircraft hours.

Thrust Reverser System

The airplane was equipped with an Aeronca, Inc., 45-1000 thrust reverser system for the TFE-731 engines. According to the manufacturer, when reverse thrust was commanded from the cockpit during a landing roll, the thrust reversers operated to reverse the direction of the engine exhaust gases to assist with stopping the airplane on the runway. The thrust reversers were designed to deploy only when the squat switches were in the "weight on wheels" mode and the throttles were in the idle position. When activated, the thrust reverser system used 28-volt power for reverser control and engine bleed air to deploy the translating structure. The electrical system in the thrust reverser incorporated an automatically initiated "stow" command if the pneumatic latches became unlocked in flight.

A rocker switch in the cockpit could be positioned to either "NORM" (normal) or "EMER STOW" (emergency). Three indicator lights in the cockpit for each thrust reverser provided the flight crew with thrust reverser status and position information. These lights, "UNLOCK," "DEPLOY," and "BLEED

VALVE," illuminated and extinguished during the application and stowing of the thrust reversers. The "UNLOCK" light would remain illuminated any time that a thrust reverser pneumatic latch disengaged or was not in the locked configuration after a thrust reverser was stowed, or if a thrust reverser failed to stow completely.

According to the manufacturer, emergency procedure training for an inflight deployment of a thrust reverser could be performed only in an appropriately equipped flight simulator.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	FLL,9 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	19:53 Local	**Direction from Accident Site:**	226°
Lowest Cloud Condition:	Few	**Visibility**	9 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	29.93 inches Hg	**Temperature/Dew Point:**	23°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Fort Lauderdale, FL (FLL)	**Type of Flight Plan Filed:**	IFR
Destination:	(MMCZ)	**Type of Clearance:**	IFR
Departure Time:	19:50 Local	**Type of Airspace:**	Class C

At 1953, the weather reported at FLL, 6 miles southwest of the crash site included few clouds at 2,500 feet and a scattered layer at 6,500 feet. The wind was calm and visibility was 9 miles. The temperature was 23 degrees C, the dew point was 22 degrees C, and the altimeter setting was 29.93 inches of mercury.

Airport Information

Airport:	FORT LAUDERDALE/HOLLYWOOD INTL FLL	**Runway Surface Type:**	Water
Airport Elevation:	9 ft msl	**Runway Surface Condition:**	Water-calm
Runway Used:	10L	**IFR Approach:**	None
Runway Length/Width:	9000 ft / 150 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	4 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Fatal	**Latitude, Longitude:**	26.163333,-80.069442

Wreckage and debris recovered from the ocean surface was examined at the U.S. Coast Guard (USCG) Station Fort Lauderdale, Florida on November 20-21, 2013. Aircraft exterior sheet metal, seat cushions, and luggage were recovered. The sheet metal showed no evidence of inflight or post-crash fire, and all fractures and tears were consistent with overload failure.

The wreckage was located on the ocean floor on December 3, 2014. The wreckage was examined in Griffin, Georgia, on January 22-23, 2014, and again on July 23, 2014.

In general, all recovered wreckage exhibited overload, impact damage consistent with high speed impact with water. In summary and excluding the examination of the thrust reversers, the following observations were noted of the airplane wreckage:

The wings were separated from the fuselage, and the outboard section of the left wing was missing. The left and right wing tip tanks were detached from the wings. Both ailerons were identified, and one wing flap was found at the retracted position. Both main landing gear were retracted.

Examination of the throttle quadrant in the cockpit revealed the left power lever was found past the maximum position and damage to the forward stop was consistent with over travel. The right lever was found one-half inch from its maximum travel. There was no visible damage to either the idle or cut-off stops.

The thrust reverser control panel and panel chassis were deformed by impact forces. The internal electronic components were corroded and/or coated with dried materials indicative of immersion in salt water. The UNLOCK, DEPLOY and BLEED VALVE annunciator light assembly for both Left and Right engines appeared intact. The NORMAL/EMERGENCY STOW switch on the thrust reverser control panel was found intact in the control panel and in the NORMAL position.

The engine N2 RPM gauges indicated 96.8 percent on the left engine, and 96.5 percent on the right. The engine turbine temperature gauges indicated 781 degrees C on the left engine, and 780 degrees C on the right. The engine fan gauges indicated 89.2 percent on the left engine, and 89.8 percent on the right.

Thrust Reverser System

Photographs taken of the submerged wreckage before its recovery from the ocean floor showed that the left engine's thrust reverser and blocker doors were not in the stowed position. Examination of components from both thrust reverser systems (left engine and right engine) after recovery indicated that the components sustained impact- and seawater-immersion damage. This damage precluded testing for

electrical, pneumatic, and mechanical continuity.

Examination of the left engine's thrust reverser system components found that the upper blocker door was attached to the reverser and found in a partially deployed position. The lower blocker door was found hanging from one of its tension links. The lower blocker door's rod arm was missing a section of its clamping arm, and the pivoting pins were broken. The lower blocker door showed a gap between the door skin and door pan with a bend at the forward edge near the gap. Areas of paint and skin on the left engine nacelle skin and body structure forward and aft of the cascade exhaust showed discoloration and scorching, with some paint blistered or missing. The entire perimeter of the outer fan duct behind which the blocker doors stow (when the thrust reverser was stowed) was missing.

Examination of the right engine's thrust reverser system components found that the upper and lower blocker doors were in the stowed position. There was no visible damage or interference observed between the blocker doors and the surrounding structure. There was no evidence of heat damage on the engine nacelle outer skin or paint.

Flight recorders

The airplane was equipped with an L-3/Fairchild FA2100 -1020, 2-hour, solid state cockpit voice recorder (CVR) from which about 2 hours of usable audio, including the entire 6-minute accident flight, were captured. The quality of the recording suggested that the copilot used a headset microphone, and the pilot's voice was captured over an area microphone.

Medical and Pathological Information

The Office of the Broward County Medical Examiner, Fort Lauderdale, Florida, performed the autopsy on the copilot. The autopsy revealed the copilot died from multiple blunt force injury.

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed forensic toxicology on specimens from the copilot. These tests were negative for drugs, alcohol, or carbon monoxide.

Tests and Research

Thrust Reverser Control Switch and Indication Panel

Examination of the thrust reverser control panel revealed that the rocker switch was intact and depressed on the left, which, according to the manufacturer, was consistent with the "NORM" (normal) position.

Examination of the status lights on the thrust reverser indication panel revealed that the filaments of the light bulbs for the left engine's "UNLOCK" status light was stretched, and the filament for the "DEPLOY" light was coiled and intact. For the right engine, the filament for "UNLOCK" was coiled and broken, and for "DEPLOY" it was coiled and intact.

Digital Electronic Engine Control (DEEC) Operation and Data Recovery

The model DEECs on the airplane included an incident recorder that collected engine and aircraft operational data and recorded it into Non-Volatile Memory (NVM). The recorder provided a record of engine speeds and inter-turbine temperatures, aircraft parameters relating to the engine, and control modes during operation. The DEEC casing was not designed to be crashworthy; therefore, memory data could be damaged or lost for a variety of reasons including, but not limited to, impact and fire damage.

The incident recorder collected data into memory for about 85 minutes of the final engine ground and/or flight time while the DEEC was powered. The DEEC recording methodology was that the actual discreet data parameter was not physically recorded to memory. Rather, a digital bit value that corresponded to a data parameter range was recorded to memory whenever a parameter was within a given range.

The DEECs from the accident airplane were recovered from the ocean, and their data downloaded successfully at Honeywell, the component manufacturer. The examination of the DEEC data revealed that, during the entire accident flight, both engines were rotating, operating, and responding to power lever inputs. The data for each engine after that time were summarized below.

Left Engine DEEC Data Summary

About 100 seconds after takeoff, the left engine DEEC data indicated the following within 1-2 seconds:

The DEEC computer sensed an N1 error in commanded speed, indicating the engine was slowing below the commanded value. The DEEC computer tripped/changed to manual mode and the N1 began an abrupt decrease, and declined to between 60 percent and 65 percent. Further, the Mach value transitioned below 0.15 and, as a consequence, the calculated weight on wheels transitioned from "in air" to "on ground".

The N1 drop/decrease lasted for about 35 seconds. During the N1 decrease, the recorded power lever angle and N2 values remained unchanged. N2 was unchanged throughout the N1 rollback, as well as the rest of the flight.

After the 35-second decrease, the recorded N1 values returned to between 80 and 85 percent.

Right Engine DEEC Data Summary

The DEEC data recovered for the right engine showed that the engine was operating and responding to

power lever movements throughout the accident flight. The right engine data did not show any variations in N1 as indicated in the left engine DEEC data.

Examination of the DEEC data indicated that, except for a 35-second time period for the left engine, the values recorded for each engine were similar.

After the left engine N1 decrease and for the remainder of the recorded data (60 seconds), both engines operated at an N1 of between 85-95 percent and an N2 RPM between 90-101.5 percent.

Examination of maintenance records revealed that as of the most recent inspection, all Airworthiness Directives were complied with and up to date.

Organizational and Management Information

Direction General of Civil Aeronautics (DGAC) of Mexico Report

On or about November 20, 2013, the DGAC performed an inspection of the operator, Aero JL. The results of the inspection produced multiple documents, which were forwarded to and translated by the FAA in Washington, D.C. The translator prepared a spreadsheet that identified the various categories inspected, the discrepancies noted, and the responses to each discrepancy by Aero JL.

According to the report, in the Recurring Training category, the general operations manual under Annual Flight Personnel Recurring Training Program did not "specify included nor authorized personnel." The report did not specify what, if any, recurring training was to be completed by flight personnel, or if the same requirements applied to contract pilots.

Additional Information

Procedures and Checklists
Section III of AFM Supplement, "Aeronca Thrust Reversers," contained the Emergency Procedures for an inadvertent thrust reverser deployment during takeoff. According to the procedures, "an inadvertent thrust reverser deployment during takeoff will be indicated by illumination of the affected thrust reverser UNLOCK and/or DEPLOY lights." The procedures stated that, if this occurred below V1 speed, an aborted takeoff should be performed. The procedures stated that, if this occurred above V1 speed, the flight crew should maintain directional control, reduce the affected engine thrust lever to idle, place the NORM-EMER STOW switch to EMER STOW, and continue the takeoff. The procedures stated that, "If UNLOCK or DEPLOY lights do not go out, Thrust Lever (affected engine) – CUTOFF." The procedures stated that the ENGINE SHUTDOWN IN FLIGHT procedure in the basic AFM should be performed.
Section IV of AFM Supplement, "Aeronca Thrust Reversers," contained the "Abnormal Procedures" for an inadvertent thrust reverser deployment in flight. Those procedures also specify that, if the UNLOCK

or DEPLOY lights do not go out, the ENGINE SHUTDOWN IN FLIGHT procedure should be performed, followed by the SINGLE-ENGINE LANDING procedure from the basic AFM.

Records Reviews

Reviews of the airplane manufacturer's records and the NTSB accident and incident database found no previously documented instance of an un-commanded inflight deployment of a thrust reverser on a Learjet 35.

Airplane Certification Tests: Flight with One Thrust Reverser Deployed

From October 7 to 11, 1977, Gates Learjet performed "In-Flight Unwanted Deployment" testing of the thrust reverser and published a report. The tests were conducted in a variety of airspeed and altitude modes. According to the flight tests conducted by an FAA pilot, Flight Test Condition 22 was at the same airspeed as the accident flight scenario and the controllability of the airplane was "acceptable." A landing was conducted in gusty conditions with a thrust reverser deployed, and according to the report, "Landing with the thrust reverser deployed and the engine shut down is the same as a single engine landing since no parts of the thrust reverser are in the free stream air."

According to the airplane manufacturer, in the event of an in-flight emergency, the typical convention was for the pilot flying to fly the airplane and take over communications with ATC. The pilot monitoring should then complete the appropriate checklist, while audibly announcing his actions as they are completed. The pilot flying was to verify these actions prior to completion. Although different flight departments may adopt their own procedures, there was no evidence that any crew coordination actions took place on the accident flight.

Administrative Information

Investigator In Charge (IIC):	Rayner, Brian
Additional Participating Persons:	Jeffrey Guzzetti; FAA/AVP-100; Washington, DC Jimmy Avgoustis; Bombardier; Dorval John Eller; Honeywell; Phoenix, AZ
Original Publish Date:	January 14, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=88451