



National Transportation Safety Board Aviation Accident Final Report

Location:	GREAT FALLS, MT	Accident Number:	SEA97LA109
Date & Time:	05/16/1997, 1314 MDT	Registration:	N1AH
Aircraft:	Learjet 35A	Aircraft Damage:	Substantial
Defining Event:		Injuries:	2 Minor

Flight Conducted Under: Part 91: General Aviation - Positioning

Analysis

The captain reported: 'Shortly after V1...there was a loss of power to the left engine....' (FAR Part 1 defines V1 as takeoff decision speed.) However, the first officer, who was the pilot flying, stated the captain retarded power on the left engine as a training exercise. The first officer stated there was no preflight discussion of emergency procedure practice. The airplane became airborne about 3,500 feet down the runway; the crew subsequently lost control of the aircraft, and it crashed to the left of the runway, and a fire erupted. The crew escaped with minor injuries. A teardown of the left engine was performed under FAA supervision at the engine manufacturer's facilities; the engine manufacturer reported that damage found during the teardown 'was indicative of engine rotation and operation at the time of impact....' Both airspeed indicator bugs were found set 9 to 11 knots below the V1 speed on the takeoff and landing data (TOLD) card. No evidence of an aircraft or engine malfunction, to include inflight fire, was found at the accident site.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the captain's inadequate preflight planning/preparation, and the subsequent improper response to a simulated loss of engine power, resulting in liftoff at an airspeed below that for which sustained flight was possible.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF

Findings

1. (C) PREFLIGHT PLANNING/PREPARATION - INADEQUATE - PILOT IN COMMAND
 2. (C) EMERGENCY PROCEDURE - IMPROPER
 3. (C) AIRSPEED(VMC) - NOT OBTAINED/MAINTAINED
 4. AIRCRAFT CONTROL - NOT POSSIBLE
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Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

On May 16, 1997, approximately 1314 mountain daylight time, a Learjet 35A, N1AH, being operated by Professional Flight Crew Services of Melbourne, Florida (d/b/a First Air Jet Charter), a 14 CFR 135 on-demand air taxi certificate holder, crashed during an attempted takeoff from runway 21 at Great Falls International Airport, Great Falls, Montana. The airplane was substantially damaged by impact forces and a post-crash fire, and the two pilots (an airline transport pilot-in-command and a commercial pilot second-in-command) received minor injuries. The flight was to be a 14 CFR 91 positioning flight to return to the aircraft's home base of Dallas Love Field, Dallas, Texas, and there were no passengers on board. Visual meteorological conditions prevailed at the time of the accident, and the flight was on an instrument flight rules (IFR) flight plan.

The pilots reported that the first officer was the pilot flying at the time of the occurrence. In a written statement attached to the operator's accident report, the captain stated the following:

The take off [sic] was normal with the exception of gusty cross winds[;] all standard call outs were made at the appropriate times during the take-off roll. Shortly after [V1, critical engine failure speed] was reached there was a loss of power to the left engine. The aircraft became airborne and the Pilot-Flying was handling the situation well when the aircraft pitched up and banked to the left[.] I then assisted on the controls but was unable to control the aircraft. The aircraft began to roll left and right as airspeed began to deteriorate[;] we leveled the wings just before impact....

In the first officer's written statement, also attached to the operator's accident report, the first officer stated the following:

After calling V1...[the captain] informed me that we had lost engine power on one of the engines....Before I could respond, the airplane lifted off....And then, the nose pitched up and the wings rocked back and forth, first to the left, and then very aggressively to the right where it looked like we were about to hit the ground with our right tip at a 45 degree angle. As we dropped, the plane came down right side up and hit the ground hard.... We continued to bounce [straight] ahead on the grass next to the runway...finally coming to rest....

...As we looked at each other, surprised to be alive [the captain] told me "If anybody asks, we lost the left engine." I said "I couldn't live with that" but as we watched the aircraft burn, I said "we are lucky to be alive, I can live with the truth."

...The FAA had happened to be in town and were there at the scene. Due to our conflict, I tried to let [the captain] tell the story and he stuck to his portion of the truth. Since what he said was all true I agreed that was how I saw it. However we left out one minor detail. [The captain] had pulled the power back on me as a training exercise....

...[The captain] also told me that at the point that we lost control, he gave me power back in the left engine.

...the target [V] speeds set in the airspeed indicators may have been set with the wrong speeds. This may have caused V1 to be called out early....With the V1 speed being called early the pilot flying would continue the take off which in turn would cause control problems. My belief is that we were at a speed below V1 which meant that we should have powered back and abort[ed] the take off....

Air traffic controllers at Great Falls who saw the aircraft reported that it became airborne, reaching an altitude of about 50 to 75 feet above ground level and flying for 1/4 to 1/2 mile, before impacting on the airport to the left of the runway and coming to a stop.

Investigators from the FAA and Learjet conducted an on-site investigation. The Learjet investigator's on-site examination field notes described the accident aircraft's flight path as follows:

...The aircraft lifted off at approximately 3500' [down the runway] and entered a left turn to a heading of 184 [degrees] for approximately 1154'. The aircraft then turned to a heading of 197 [degrees] for approximately 1822' before impacting the ground with the right tip tank. The right tip tank ruptured....Fuel from the right tip tank ignited. The aircraft bounced and spun 180 [degrees]. The airplane...tracked across the ground on a heading of 209 [degrees] for approximately 1093'. The aircraft came to rest facing north 1.24 NM (7534') from the end of runway 21.

Photographs taken by the Learjet investigator showed a takeoff and landing data (TOLD) card in the aircraft cockpit with a computed V1 speed of 127 knots, VR (rotation speed) of 134 knots, and V2 (takeoff safety speed) of 137 knots (the takeoff distance was not filled in on the card); the captain's airspeed indicator "bug" set at 116 knots; the first officer's airspeed indicator "bug" set at 118 knots; the left engine turbine temperature indicator captured at 371 degrees C (within the normal operating range marked on the indicator); and the right engine turbine temperature indicator captured at 327 degrees C (also within the normal operating range marked on the indicator.) The on-scene investigators reported to the NTSB investigator-in-charge (IIC) that they found no evidence of an aircraft or engine malfunction at the accident site, and no evidence of inflight fire.

The accident aircraft was equipped with a cockpit voice recorder (CVR.) The CVR was removed from the aircraft and sent to the CVR lab at the NTSB Engineering and Computer Services Division, Washington, DC, for readout. The attempt to read out the accident aircraft's CVR revealed that the CVR was inoperative at the time of the accident, and contained no data.

The accident aircraft's engines were removed and shipped to the manufacturer, AlliedSignal Aerospace of Phoenix, Arizona. A teardown inspection of the left engine was subsequently conducted under FAA supervision at AlliedSignal's Services Repair and Overhaul Facility in Phoenix on July 17 and 18, 1997. In its report to the NTSB on the teardown examination (number 21-9792, dated November 7, 1997), AlliedSignal reported: "...The teardown and examination of the engine disclosed that the type and degree of damage was indicative of engine rotation and operation at the time of impact with the ground. No pre-existing conditions were found which would have prevented normal operation...."

In a telephone conversation with the first officer on July 28, 1997, the first officer reiterated his written account of the accident sequence to the NTSB IIC. The first officer further stated that the V-speeds were calculated for the accident flight and written onto the TOLD card, but that on the accident flight, he had overlooked setting the airspeed indicator "bugs" with the takeoff V-speeds for the accident takeoff. He stated that the airspeed bugs thus were set to the landing speeds for the previous flight, approximately 11 knots below the correct takeoff V-speeds. (NOTE: The Normal Procedures section of the FAA-approved Learjet 35A/36A Flight Manual contains the steps "Takeoff Data (N1, V1, VR, V2, Takeoff Distance) - Computed and bugs set..." in the Before Starting Engines procedure, and "Takeoff Data (N1, V1, VR, V2) - Reviewed and

Bugs Set" in the "Taxi and Before Takeoff" procedure. These steps are applicable both at the original departure point of a flight, and to through flights.) The first officer also stated to the NTSB IIC during this conversation that prior to the accident, there was no preflight discussion or briefing between the pilots regarding possible simulated emergencies.

A Great Falls special weather observation at 1329 (approximately 15 minutes after the reported time of the accident) reported the winds from 260 degrees at 7 knots, gusting to 19 knots.

According to the FAA-approved Learjet 35A/36A Flight Manual, the memory items for the "Engine Failure During Takeoff" procedure are as follows:

BELOW V1 SPEED

1. Perform ABORTED TAKEOFF procedure, this section. the "Aborted Takeoff" procedure are: Thrust Levers - IDLE; Spoilers - EXT.]

[NOTE: Memory items for Wheel Brakes - Apply;

ABOVE V1 SPEED

1. Rudder and Ailerons - As required, for directional control. 2. Accelerate to VR. NOTE Directional control is improved if the nose wheel is kept on the runway until VR. 3. Rotate at VR; Climb at V2. 4. GEAR - UP, when positive rate of climb is established. 5. When clear of obstacles, accelerate to V2 + 30 and retract flaps. NOTE Lateral control is improved with tip tanks empty. If time permits, it is recommended that tip tank fuel be jettisoned.

Aircraft performance information computed by Learjet indicated that, under the accident flight conditions, for a one-engine failure at V1 in which takeoff is continued according to the flight manual procedure, the VR of 134 knots is attained 3,382 feet past the start of the takeoff roll, and liftoff occurs 4,704 feet beyond the start of the takeoff roll.

Pilot Information

Certificate:	Airline Transport; Flight Instructor	Age:	37, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	Toxicology Performed:	
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	Last Medical Exam:	01/24/1997
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	8700 hours (Total, all aircraft), 2000 hours (Total, this make and model), 8200 hours (Pilot In Command, all aircraft), 110 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	Learjet	Registration:	N1AH
Model/Series:	35A 35A	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	35-398
Landing Gear Type:	Retractable - Tricycle	Seats:	10
Date/Type of Last Inspection:	05/13/1997, AAIP	Certified Max Gross Wt.:	18500 lbs
Time Since Last Inspection:	13 Hours	Engines:	2 Turbo Fan
Airframe Total Time:	8019 Hours	Engine Manufacturer:	Garrett
ELT:	Not installed	Engine Model/Series:	TFE731-2-2B
Registered Owner:	AGH AVIATION LTD.	Rated Power:	3150 lbs
Operator:	PROFESSIONAL FLIGHT CREW SVCS	Air Carrier Operating Certificate:	On-demand Air Taxi (135)
Operator Does Business As:	FIRST AIR JET CHARTER	Operator Designator Code:	PISA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	GTF, 3674 ft msl	Observation Time:	1329 MDT
Distance from Accident Site:	0 Nautical Miles	Direction from Accident Site:	0°
Lowest Cloud Condition:	Clear / 0 ft agl	Temperature/Dew Point:	24° C / 4° C
Lowest Ceiling:	None / 0 ft agl	Visibility	10 Miles
Wind Speed/Gusts, Direction:	7 knots/ 19 knots, 246°	Visibility (RVR):	0 ft
Altimeter Setting:	30 inches Hg	Visibility (RVV):	0 Miles
Precipitation and Obscuration:			
Departure Point:	(GTF)	Type of Flight Plan Filed:	IFR
Destination:	DALLAS, TX (DAL)	Type of Clearance:	IFR
Departure Time:	1310 MDT	Type of Airspace:	Class D; TRSA

Airport Information

Airport:	GREAT FALLS INTL (GTF)	Runway Surface Type:	Asphalt
Airport Elevation:	3674 ft	Runway Surface Condition:	Dry
Runway Used:	21	IFR Approach:	None
Runway Length/Width:	10502 ft / 150 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	2 Minor	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Minor	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	GREGG NESEMEIER	Adopted Date:	07/13/1998
Additional Participating Persons:	LEN WHEELER; HELENA, MT JAMES B TIDBALL; WICHITA, KS DAVE CHAPEL; PHOENIX, AZ		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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