NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

July 6, 2000

GROUP CHAIRMAN'S FACTUAL REPORT

OPERATIONAL FACTORS/HUMAN PERFORMANCE

DCA00MA005

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A. ACCIDENT

Operator:	Sunjet Aviation, Inc.
Location:	Mina, South Dakota
Date:	October 25, 1999
Time:	About 1214 central daylight time (1314 eastern daylight time)[1]
Airplane:	Gates Learjet 35, N47BA

B. OPERATIONAL FACTORS/HUMAN PERFORMANCE GROUP

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[1] All times are eastern daylight time (EDT) based on a 24-hour clock, unless otherwise noted. Actual time of accident is approximate.

C. SUMMARY

On October 25, 1999, about 1314 Learjet model 35, N47BA, crashed near Aberdeen, South Dakota, after running out of fuel. The airplane departed Orlando, Florida, for Dallas, Texas, about 0920. There were approximately four hours and 45 minutes of fuel on board. Federal Aviation Administration air traffic control (ATC) lost radio contact in the area north of Gainesville, Florida, after clearing the airplane to flight level (FL) 390. It was intercepted by several United States Air Force fighter aircraft as it proceeded along the course. The military pilots observed the forward windshields of the Learjet to be frosted on the inside. They could not see into the cabin. The military pilots did not observe any structural anomaly or other unusual condition. The airplane subsequently was observed to depart controlled flight and spiral to the ground. It impacted in an open field. The airplane was owned/operated by Sunjet Aviation of Sanford, Florida. There were four passengers and two flight crew on board; all were fatally injured.

D. DETAILS OF THE INVESTIGATION

The Operational Factors/Human Performance Group convened at Sanford Airport, Sanford, Florida (SFD), on October 25, 1999, to begin the field phase of the accident investigation. Sunjet Aviation personnel interviewed included the Director of Operations, a customer service representative, a line service technician, the Chief Pilot, a Designated Pilot Examiner/Check Airman, and line pilots, including two captains who had flown the accident airplane on two different flights immediately prior to the accident flight. An interview with the Federal Aviation Administration (FAA) Principal Operations Inspector (POI) on the Sunjet Aviation certificate, was conducted at the Orlando FSDO. The Operational Factors/Human Performance Group also interviewed personnel employed by Aircraft Service International Group, a fixed based operator (FBO) located at Orlando International Airport, Orlando, Florida. The personnel interviewed included the manager, two fuelers, and a ramp agent.

Applicable manuals and documents were obtained from Sunjet Aviation and the FAA.

The Operational Factors/Human Performance Group concluded the initial field phase of the accident investigation on October 30,1999.

On November 5, 1999, Mr. Kenneth Egge from the Operational Factors/Human Performance Group conducted a telephone interview of an individual who had flown as a passenger on a flight operated by Sunjet Aviation on October 20, 1999.

On December 1, 1999, Dr. Evan Byrne, and Mr. Kenneth Egge from the Operational Factors/Human Performance Group conducted a telephone interview of a friend of the accident first officer who was with the accident first officer on the weekend before the accident.

On December 2, 1999, Dr. Evan Byrne, and Mr. Kenneth Egge from the Operational Factors/Human Performance Group accompanied by Ms. Victoria Anderson representing the FAA, conducted a telephone interview of a former Sunjet Aviation pilot and ground school instructor.

On December 3, 1999, Dr. Evan Byrne, and Mr. Kenneth Egge from the Operational Factors/Human Performance Group conducted a telephone interview of a friend of the accident first officer who was a former Sunjet Aviation mechanic.

On February 2, 2000, Dr. Evan Byrne, and Mr. Kenneth Egge from the Operational Factors/Human Performance Group accompanied by Mr. Eric West representing the FAA, conducted a telephone interview of an individual who had formerly been employed by Sunjet Aviation to do contract maintenance work.

1.0 HISTORY OF FLIGHT

According to the information on the Sunjet Aviation Charter Flight Request form,[2] on October 25, 1999, the flight crew was scheduled to begin a two-day trip sequence consisting of five flights. The flights on the first day were from Orlando Sanford Airport, Sanford, Florida (SFB), to Orlando International Airport (MCO), Orlando, Florida; MCO to Dallas-Love Field (DAL), Dallas, Texas; and from DAL to Houston/William P. Hobby (HOU), Houston, Texas. After remaining overnight in Houston, on October 26, 1999, the plan was to depart HOU for MCO and then return to SFB.

The first of the five flights was scheduled to depart SFB at 0800. This was a Visual Flight Rules (VFR) positioning flight to MCO approximately 15 nm away and operating under the provisions of 14 Code of Federal Regulations (CFR) Part 91. The second flight, an Instrument Flight Rules (IFR) flight operating under the provisions of 14 Code of Federal Regulations (CFR) Part 135 was scheduled to depart MCO at 0900. The other flights did not have specific scheduled departure times.

According to the Sunjet Aviation customer service representative[3] on duty at SFB the day of the accident, the captain reported for duty about 0630 and the first officer arrived about 0645. She stated that both pilots were in a good mood and appeared to be in good health.

A Sunjet Aviation, Inc. line service technician[4] stated that the captain asked him to pull the airplane out of the hangar and to fuel it to 5,300 pounds. The captain also asked him to connect a ground power unit (GPU) to the airplane and to put a snack basket and cooler in the airplane.[5] The first officer arrived at the airplane just before the

[2] See Attachment 5-1.
[3] See Attachment 1-5.
[4] See Attachment 1-18.
[5] The cooler contained softdrinks and wet ice.

fueling process started, and stayed in the cockpit while the airplane was being fueled. The first officer then went inside the terminal building while the captain performed the preflight inspection of the airplane.

An IFR flight plan was filed with Saint Petersburg Automated Flight Service Station at 0725. The filed information indicated that N47BA proposed to depart MCO at 0900 via a route over Cross City, Florida (CTY), to a point defined by latitude/longitude coordinates of 32° 51' North/ 96° 51' West, then direct to DAL. The requested altitude was 39,000 feet (flight level 390) with a true airspeed of 440 knots. Additional information in the flight plan indicated a total of five persons on board (two pilots and three passengers[6]), four hours and 50 minutes of fuel and two hours and 10 minutes flying time, which would result in an arrival time of 1010 central daylight time at DAL.

When the airplane was ready to depart the ramp at SFB, the Sunjet Aviation line service technician[7] stated that the GPU was disconnected from the airplane and the engines were started. The airplane remained on the ramp for 10 to 12 minutes before taxiing to the runway.

The Learjet departed SFB about 0754 on October 25, 1999, according to a friend[8] of the accident first officer who observed the flight depart.

The flight arrived at MCO about 0810. An Aircraft Service International Group employee[9] at MCO stated that after the airplane arrived, the captain told him that they were picking up passengers and did not require additional fuel. According to this employee, the passengers arrived about 30 minutes later and boarded the airplane. Several bags were placed on board the airplane, including what the FBO employee described as a big golf bag weighing about 30 pounds.

According to ATC transcripts, the flight departed MCO about 0919 bound for DAL. At 0921:46 the flight contacted the Jacksonville center controller and reported climbing through an altitude of 9,500 feet for 14,000 feet.[10]

At 0921:51, the controller instructed N47BA to climb and maintain flight level 260 (FL 260). N47BA acknowledged the clearance by stating "two six zero bravo alpha."

At 0923:16, the controller cleared N47BA direct to Cross City, then direct to DAL. N47BA acknowledged the clearance.

At 0926:48, N47BA was issued instructions to change radio frequency and contact another Jacksonville center controller. N47BA acknowledged the frequency change.

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[6] According to the Sunjet Aviation Director of Operations, one additional passenger boarded the flight at MCO who was not on the original charter flight request. See Attachment 1-2.

[7] See Attachment 1-18.

[8] See Attachment 1-29.

[9] See Attachment 1-12.

[10] ATC voice tapes indicate that all transmissions from N47BA were made by a female pilot.

N47BA called the Jacksonville center controller at 0927:10 and stated that the flight was climbing through an altitude of FL 230. At 0927:13, the controller instructed N47BA to climb and maintain FL 390. N47BA acknowledged the clearance at 0927:18 by stating, "three nine zero bravo alpha."

At 0933:38, or six minutes and 20 seconds after N47BA acknowledged the previous clearance, the controller instructed N47BA to change radio frequency and contact another Jacksonville center controller. The controller received no response from N47BA. The controller called the flight five more times over the next four and one-half minutes, but received no response.

At 0938:24, a Cubana Airlines flight that was also on the frequency, attempted to call N47BA and stated, "JAX is calling you how do you read." The Cubana flight informed the controller that no response was received.

About 1052, an F-16 test pilot from the 40th Flight Test Squadron at Elgin Air Force Base, Florida,[11] flew within eight nautical miles of N47BA. About 1054, at a range of 2,000 feet from the accident airplane, at an altitude about 46,400 feet, he made two radio calls to N47BA but did not receive a response. He began a visual inspection of N47BA about 1100. There was no visible damage and he did not see any ice accumulation on the exterior of the airplane. Both engines were running and the rotating beacon was on. He stated that he could not see inside the passenger section of the airplane because the windows seemed to be dark. He noticed that the entire right cockpit windshield was opaque, as if condensation or ice covered the inside. The left cockpit windshield was opaque, although several sections of the center of the windshield seemed to be only thinly covered; a small rectangular section was clear, with only a small section of the glareshield visible through this area. He did not see any flight control movement while closely inspecting the airplane. About 1112, he concluded the inspection of N47BA and proceeded to Scott Air Force Base.

About 1213, a flight of two F16s with the identification, TULSA13, were vectored to intercept the accident airplane by Minneapolis Air Route Traffic Control Center. The TULSA13 pilot asked, "do you want us to try to ascertain if there is someone asleep up there?" TULSA13 reported to the center controller that he could not see any movement in the cockpit. About 1225, TULSA13 reported that the windshield was dark and he could not tell if the windshield was iced or not.

About 1233, TULSA13 maneuvered in front of the accident airplane and reported that "we're not seeing anything inside, could be just a dark cockpit though, ah he is not reacting, moving or anything like that he should be able to have seen us by now."

About 1238, TULSA13 stated, "my wingman is going to make a final pass and then we are going to head back to the tanker." The wingman reported that "we did not get close enough to see any icing on the window due to our configuration ... we did get

[11] See Attachment 19.

up behind him but not see anything." About 1239, TULSA13 departed for the tanker.

About 1250, NODAK32, a flight of two F-16s, was vectored to intercept N47BA. TULSA 13 returned from refueling and both flights maneuvered in close proximity to N47BA. About 1257, TULSA13 reported that "we've got two visuals on it. It's looking like the cockpit window is iced over and there's no displacement in any of the control surfaces as far as the ailerons or trims." About 1301, TULSA13 returned to the tanker.

At 1310:49, ATC radar indicated that N47BA began a right turn and descent. One NODAK airplane remained to the west, while at least one TULSA airplane broke away from the tanker and followed N47BA. At 1311:26, the NODAK chase pilot reported, the target is descending and he is doing multiple aileron rolls, looks like he's out of control ... in a severe descent, request an emergency descent to follow target." The TULSA13 pilot reported, "It's soon to impact the ground he is in a descending spiral."

2.0 FLIGHT CREW INFORMATION

Both crewmembers held valid Florida driver's licenses with a history of no accidents or violations in the preceding three years. A search of the records at the National Driver Registry found no history of driver's license revocation or suspension.

Both crewmembers were certificated under Sunjet Aviation, Inc., and Federal Aviation Administration (FAA) certification requirements.

A review of FAA records indicated that neither of the two crewmembers had any record of airplane accident, incident, or enforcement actions.

2.0.1 The Captain, Michael J. Kling

Date of birth: [redacted] 1956
Date of hire with Sunjet Aviation, Inc.: September 21, 1999[12]

Pilot certificates and ratings:
Airline Transport Pilot Certificate Number [redacted] (Issued 09/21/99)
Airplane Multiengine Land/Airline Transport Pilot
Airplane Single Engine Land/Commercial Privileges

Type Ratings: B-707/Airline Transport Pilot
B-720/Airline Transport Pilot
LR-JET/Airline Transport Pilot

Medical certificate:
First Class (issued 06/16/99), with no limitations.

A review of the FAA records indicated that he had no history of failures or re-tests for FAA pilot certificates and ratings.

According to company records[13], the captain started his flying career in 1979 in the United States Air Force (USAF). According to his resume, the captain served as a copilot and as a standards/evaluation copilot on the KC-135A from 1981 to 1984. His resume also stated that he was an emergency procedures evaluator (simulator) during this period. From 1984 to 1988 the captain served as an aircraft commander on an E-3A. From 1988 to 1993 the captain served as a classroom and in-flight instructor pilot on the KC-135E aircraft. During his United States Air Force (USAF) career, the captain accumulated 3,953 hours flying KC-135 and E-3A aircraft and achieved the rank of Major.

According to his collegues at Sunjet, the captain was described as an excellent pilot who transitioned into the Learjet without any difficulty. He was said to be knowledgeable about the airplane and a confident pilot with good situational awareness.

Family and co-workers described the captain as being in excellent health. He was a nonsmoker who did not take medications nor consume alcohol.

[12] According to the Director of Operations, this is the date the Captain was assigned his duty position on the Learjet with Sunjet Aviation, Inc. See attachments 1-2 and 2-8.
[13] See attachment 2-1.

Flight experience according to Sunjet Aviation, Inc. records:[14]

FLYING TIME	HOURS
Total	4,280
Total Sunjet Aviation	60
Total Sunjet Aviation Learjet PIC	38
Total Sunjet Aviation Learjet SIC	22
Last 24 hours	0
Last 7 days	6
Last 30 days	35

Training and checks:

TRAINING / CHECK	DATE
Initial Learjet 35 type rating	09/21/99
Airman Competency/Proficiency Check (Learjet 35)[15]	09/21/99

[14] See attachments 2-1 and 2-9 through 2-11.

[15] FAR 135.293 Initial and recurrent pilot testing requirements; FAR135.297 Pilot-in-command: Instrument proficiency check requirements; FAR 135.299 Pilot-in-command line checks: routes and airports.

2.0.2 The First Officer, Stephanie Bellegarrigue

Date of birth: [redacted] 1972
Date of hire with Sunjet Aviation, Inc.: February 24, 1999

Pilot certificates and ratings:
Commercial Pilot Certificate Number [redacted] (Issued 04/15/99)
Airplane Multiengine Land/Commercial Pilot
Airplane Single Engine Land/Commercial Pilot
Instrument Airplane

Type Ratings: LR-JET/Commercial Privileges
CE-500/Commercial Privileges

Flight Instructor Certificate Number [redacted] (Issued 07/06/93)
Airplane Single Engine/CFI
Instrument Airplane/CFI

Medical certificate: First Class (issued 10/01/99), with Limitation: Must wear corrective lenses

The first officer attended Embry-Riddle Aeronautical University from 1991 to 1993 earning a bachelor of science degree in aeronautical sciences. While there, the first officer earned the following pilot certificates and ratings: private pilot, commercial pilot, instrument airplane, multiengine, and certified flight instructor.[16] Between 1993 and her date of hire with Sunjet the first officer worked as a flight instructor and charter pilot flying light piston twins. A review of FAA records indicated that on July 30, 1995, she was issued a Temporary Airman Certificate for airplane multi-engine flight instructor. On September 15, 1995, the FAA recalled her for a retest on this certificate and found that she did not meet the minimum standards; therefore, the authorization was rescinded.

The first officer was described by pilots who had flown with her as knowledgeable pilot with good aircraft handling skills. She was recognized by pilots who worked at Sunjet as a confident pilot who had excellent radio communication skills. A pilot who had flown with the first officer before she worked at Sunjet stated that the first officer was a serious pilot who had a "meticulous" style in the cockpit and was not someone who abbreviated procedures or neglected checklists.

The first officer was reported by her friends to be in good health. She participated in ballet a couple times a week. Friends described the first officer as a nonsmoker who did not use caffeine or other medications.

[16] See attachment 3-22.

Flight experience according to Sunjet Aviation, Inc. records:

FLYING TIME	HOURS
Total	1,751
Total Sunjet Aviation	251
Total PIC	1,300
Total Sunjet Aviation SIC	251
Total Sunjet Learjet SIC	99
Last 24 hours	0
Last 7 days	6
Last 30 days	35
Last 90 days	104

Training and checks:

TRAINING / CHECK	DATE
Initial Learjet 35 type rating	04/15/99
Initial Learjet 35 SIC check ride	04/15/99
Airman Competency/Proficiency Check (Learjet 35)[17]	04/15/99

2.0.3 72-Hour History – The Captain

The captain lived in the Orlando area. During the three days before the accident the captain's family reported that he participated in routine activities around the house. On October 24, the captain went to bed about 2200. On October 25, the captain left the house between 0530 and 0600. He arrived at the airport about 0630.

2.0.4 72-Hour History – The First Officer

The first officer lived in the Orlando area. In the 3 days before the accident she visited with friends in the Daytona Beach & Orlando area. On October 23 and 24, the first officer went to bed about 0100 and awoke about 0900. On October 24, the first officer went to sleep about 2200. On October 25, the first officer awoke about 0545 and arrived at the airport about 0645.

2.0.5 Medical and Pathological Information

Tissue specimens from the first officer tested negative for a wide range of drugs, including major drugs of abuse.[18] The Final Forensic Toxicology Fatal Accident Report[19] from the FAA showed that specimens contained 41 mg/dL of ethanol and 1 mg/dL of

[17] FAR 135.293 Initial and recurrent pilot testing requirements.
[18] The five drugs of abuse tested in postaccident analysis are marijuana, cocaine, opiates, phencyclidine, and amphetamines.
[19] See attachment 16-1.

acetaldehyde was detected in muscle. The report noted that the "ethanol found in this case may potentially be from postmortem ethanol formation and not from the ingestion of ethanol."

Specimens from the captain were not suitable for toxicological testing.

3.0 AIRPLANE INFORMATION

According to FAA documents, the airplane was N47BA, a Gates Learjet model 35, serial number 060, manufactured in 1976. The registered airplane owner was Jet Shares One, Inc., with a registration date of October 25, 1999. Prior to this date, the registered airplane owner was McMillin Aircraft, Inc., with a registration date of April 7, 1999. This airplane was included in the Sunjet Aviation Operations Specifications, Aircraft Listing, section D085, and Sunjet Aviation was authorized to conduct operations under 14 CFR Part 135 using this airplane. The seating configuration of the airplane was a total of eight passenger seats.

3.0.1 Cabin Pressurization System

According to the Learjet 35/36 Pilot's Manual,[20] cabin pressurization is provided by conditioned air entering through the cabin through the air distribution ducts and controlled by modulating the amount of air exhausted from the cabin. Components of the pressurization system are a cabin air exhaust valve, cabin safety valve, differential pressure relief valve, pressurization jet pump and pressurization module. All pressurization controls and indicators are on a panel in front of the copilot. During ground operation, electrically controlled solenoids control the cabin air exhaust valve to maintain a maximum of 0.25 psi differential. During flight, power is removed from the electrically operated solenoids which makes the pressurization completely independent of the electrical system. With the AUTO-MAN switch in AUTO position, controlling vacuum from the pressurization jet pump opens and closes the cabin air exhaust valve. As the exhaust valve closes, the increase in cabin pressure is sensed by the altitude controller which meters more vacuum to the rate controller. As more vacuum is metered to the rate controller, the ratio of pressure to vacuum decreases. The reduced pressure in the up rate chamber of the rate controller is sensed by the exhaust control valve. With the changing control chamber pressure, an unbalanced condition will exist and move the valve open until the proper amount of air is exhausted to maintain the altitude controller selection. The reduced pressure is also sensed by the rate chamber of the rate controller and as pressure decreases, the down rate needle valve opens, metering more cabin pressure to the vacuum source. An aneroid switch will limit cabin altitude to 10,000 feet when in the AUTO mode. With the AUTO-MAN switch in the MAN position, the cabin altitude is controlled by manually positioning the outflow valve with the red UP-DN switch.

[20] See Attachment 17-8 to 17-10, 17-12, and 17-15.

3.0.1.1 Pressurization Controls

Normal pressurization is controlled with the Altitude Controller and the RATE Selector. Prior to takeoff, the AUTO-MAN switch is set to AUTO, the Cabin Air Switch to NORM, the Airplane Altitude Selector knob to cruise altitude and the IN NORMAL/OUT DEFOG knob pushed in. After takeoff the rate knob may be turned toward INCR or DECR to obtain a recommended rate of cabin pressurization of 600 (±50) feet per minute (fpm). The rate is monitored by the Cabin Rate-of-Climb indicator and may be varied with the RATE selector knob. Cabin altitude is monitored with the Cabin Altimeter. This altimeter also includes an aircraft cabin altitude and pressure differential scale.

3.0.1.2 Cabin Altitude Warning

If cabin altitude reaches 10,000 feet, the cabin pressurization aural warning will sound. The aural warning may be silenced for approximately 60 seconds by moving the HORN SILENCE-OFF switch to the HORN SILENCE position. The warning circuit may be tested by turning the test switch to CABIN ALT and depressing the center button.

3.0.1.3 Defog Control System

The IN NORMAL/OUT DEFOG knob is used to route bleed air flow over the external surface of the windshield or internally out of the "footwarmers." In the IN position all air is routed through the "footwarmers;" in the OUT position all bleed air is routed externally. A check valve prevents back flow of air through the "footwarmers."

3.0.1.4 Emergency Cabin Pressurization

The windshield defog air can be routed into the cabin as an emergency source of pressurization. This is accomplished by pushing the IN NORMAL/OUT DEFOG knob (full in), setting the Windshield Heat Switch to AUTO and the CABIN AIR Switch OFF. Pressurization will then be maintained automatically. If, however pressurization is not maintained in the AUTO position, cabin altitude can be maintained by controlling the outflow valve using the manual UP/DN switch.

3.0.2 Oxygen System

According to the Learjet 35/36 Pilot's Manual,[21] the aircraft oxygen system provides oxygen service for the flight crew and passengers. The system consists of the crew and passenger distribution systems, a high-pressure oxygen storage cylinder, a shutoff valve and pressure regulator assembly, an oxygen pressure gauge, overboard

[21] See Attachments 17-19 and 17-20.

discharge relief valves and indicator, an oxygen aneroid switch, an oxygen solenoid valve, a manual (PASS MASK MAN-AUTO) aneroid bypass valve, a manual (PASS OXY NORM-OFF) oxygen shutoff valve, and lanyard actuated passenger mask oxygen valves. Electrical power to operate the oxygen solenoid valve is supplied through the 7.5-amp OXY VAL circuit breaker on the pilot's circuit breaker panel. Oxygen is available to the crew at all times when the oxygen cylinder shutoff valve is open and can be made available to the passengers either automatically above 14,000 (±750) feet cabin altitude, or manually at all altitudes through use of cockpit controls on the pilot's sidewall.

According to the Limitations section of the Learjet 35/36 Airplane Flight Manual, there is a NOTE stating that crew and passenger oxygen masks were not approved for use above 40,000 feet cabin altitude. A WARNING in this section stated that "passenger masks are intended for use during an emergency descent to an altitude not requiring supplemental oxygen." Further, it states that "passenger masks will not provide sufficient oxygen for prolonged operation above 34,000 feet cabin altitude. Prolonged operation above 25,000 feet cabin altitude with passengers on board is not recommended." The maximum operating altitude for the airplane is 45,000 feet.

3.0.2.1 Oxygen Storage and Pressure Regulation

The oxygen storage cylinder has a storage capacity of 38 cubic feet at 1800 psi. The cylinder is located in the airplane's nose compartment. The shutoff valve and pressure regulator assembly provides for pressure regulation, pressure indication, and servicing. Oxygen pressure is available to the passenger and crew distribution systems and is regulated to a pressure of 60 to 80 psi when the shutoff valve is open. There is also a "burst disc" pressure relief valve incorporated to discharge the oxygen cylinder contents overboard in the event that cylinder pressure reaches 2700 to 3000 psi. Should the cylinder contents be discharged overboard, the green overboard discharge indicator on the outside surface of the aircraft near the storage cylinder will be ruptured or missing.

3.0.2.2 Oxygen Pressure Gauge

The oxygen pressure gauge is located on the center instrument panel or pilot's sidewall. The gauge is calibrated from 0 to 2000 in psi. The gauge is a direct-reading type that is plumbed to the high-pressure side of the regulator and indicates oxygen cylinder pressure only.

3.0.2.3 Oxygen System Cockpit Controls

The oxygen system cockpit controls consist of two control valves, labeled PASS OXY NORM-OFF and PASS MASK MAN-AUTO, located on the pilot's sidewall above the armrest. The PASS OXY control valve controls oxygen availability to the passenger oxygen distribution system. The PASS MASK control valve provides automatic or manual mode selection for the passenger oxygen distribution system. Oxygen is

available to the crew oxygen distribution system at all times when the oxygen cylinder shutoff valve is open. Control positions and system function is as follows:

1. With the PASS OXY valve in the NORM position and the PASS MASK valve in the AUTO position, oxygen is available to the passenger distribution system and the aneroid-controlled solenoid valve will deploy the passenger masks automatically. Should the cabin altitude reach 14,000 (±750) feet the aneroid switch will open the solenoid valve, the passenger oxygen masks will deploy and the upper center panel lights will illuminate. Normally, the controls should be in this position.

2. With the PASS OXY valve in the NORM position and the PASS MASK valve set to MAN, oxygen is available to the passenger distribution system and the passenger masks will deploy. Setting the PASS MASK valve to MAN will bypass the solenoid valve and allow oxygen system pressure to deploy the passenger masks. This position can be used to deploy the passenger masks at any cabin altitude.

3. With the PASS OXY valve in the OFF position, oxygen is not available to the passenger distribution system regardless of the position of the PASS MASK valve. This position can be used when oxygen is required for the crew only.

3.0.3 Passenger Oxygen Masks

Passenger oxygen masks are stowed in compartments in the cabin ceiling upper-center panel. Whenever the compartment doors open automatically (PASS OXY-NORM, PASS MASK-AUTO) or manually (PASS OXY-NORM, PASS MASK-MAN), oxygen is available for passenger use. Passengers should don masks and pull lanyard. An orifice is incorporated in the mask to provide a constant oxygen flow of 4.1 liters per minute. Should the compartment doors be inadvertently opened from the cockpit, pressure must be bled from the system by pulling one of the lanyards before the masks can be re-stowed. The compartment doors can be opened manually for mask cleaning and servicing by releasing the latch labeled OXYGEN adjacent to each door. When the doors are opened using this method, no oxygen flow is available to the masks.

3.0.4 Crew Oxygen Masks

The flight crew masks are stowed on straps or brackets behind the pilot's and copilot's seats. The regulator on each mask incorporates a lever for selecting NORM (diluted oxygen) or 100% oxygen. Each mask incorporates a microphone controlled by the OXY-MIC-ON-OFF switch on the jack panel. An electrical cord extends from each mask and is plugged into the OXY-MIC jack on the jack panel. With the OXY-MIC-ON-OFF switch in the ON position, the microphone is keyed through the microphone switch on the forward side of the outboard horn of each control wheel. A pressure detector is installed in each mask oxygen supply line to show visible verification of oxygen pressure to the mask. A quick disconnect is provided for each crewmember. When the mask bayonet is inserted into the quick-disconnect, a spring-loaded poppet moves off its seat and allows oxygen flow into the mask supply line.

According to the Limitations section of the Learjet 35/36 AFM, above FL 410, "pilot, copilot and passengers must wear oxygen masks."

According to 14 CFR 135.89, "Pilot requirements: Use of oxygen," whenever a pressurized aircraft is operated at altitudes above 35,000 feet MSL, at least one pilot at the controls shall wear, secured and sealed, an oxygen mask. If one pilot leaves a pilot duty station of an aircraft when operating at altitudes above 25,000 feet MSL, the remaining pilot at the controls shall put on and use an approved oxygen mask until the other pilot returns to the pilot duty station of the aircraft.

In the Learjet 35/36 Airplane Flight Manual, the operation of four different types of crew oxygen masks was described as follows:

3.0.4.1 ZMR 100 Series Diluter-Demand Crew Oxygen Masks

With 100% OXY position (control lever) down selected on the mask regulator, the mask will provide 100% oxygen at all cabin altitudes. The 100% OXY position should be maintained on undonned masks to reduce crewmember action in the event of pressurization system failure or smoke in the cabin. 100% OXY must be selected for cabin altitudes above 20,000 feet.

With NORMAL position (control lever up) selected on the mask regulator, the mask will deliver diluted oxygen. When using oxygen at cabin altitudes below 20,000 feet, the NORMAL position should be selected to conserve oxygen and provide greater oxygen duration times.

According to the Limitations section of the Learjet 35/36 AFM, in aircraft with ZMR 100 series crew oxygen masks, above FL 250, "one crewmember must wear oxygen mask around his neck."

3.0.4.2 6600214 Series Crew Oxygen Masks with Robertshaw Regulators

With NORMAL selected on the Pressure Regulator Control and "normal" (100% lever locked up) selected on the Diluter Control, the crew mask will deliver automatic oxygen dilution from sea level to 30,000 feet cabin altitude. Above 30,000 feet cabin altitude, the mask will provide 100% oxygen and maintain a slight positive pressure.

To obtain 100% oxygen at any time, depress the 100% lever.

For emergency operation, select EMERGENCY on the Pressure Regulator Control and depress the 100% lever on the Diluter Control. With the regulator controls in this position, the crew mask will deliver 100% oxygen and maintain a slight positive pressure for respiratory protection from smoke and fumes.

According to the Limitations section of the Learjet 35/36 AFM, in aircraft with 6600214 series crew oxygen masks, above FL 250, "crew masks must be in the quick-donning position which allows donning within 5 seconds."

3.0.4.3 6600214 Series Masks with Puritan-Bennett Regulators

With NORM selected on the Pressure Regulator Control, the crew mask will deliver automatic oxygen dilution from sea level to 33,000 feet cabin altitude and 100% oxygen above 33,000 feet cabin altitude. Automatic positive pressure breathing is provided above 39,000 feet cabin altitude.

To obtain 100% oxygen at any time, select 100% on the Pressure Regulator Control.

For emergency operation, select EMER on the Pressure Regulator Control. With the regulator control in this position, the crew mask will deliver 100% oxygen, maintain a slight positive pressure in the mask cup at all times for respiratory protection from smoke or fumes, and automatic positive pressure breathing above 39,000 feet cabin altitude.

3.0.4.4 Scott ATO Masks

To check for oxygen availability to the mask while stowed, depress the PRESS TO TEST button/knob on the bottom of mask regulator – oxygen will flow while button is held.

To don crew oxygen masks:

(1) Remove hats and 'ear muff' type headsets.
(2) Squeeze and hold the red handles on the mask pressure regulator together to inflate the pneumatic harness for donning.
(3) Position harness over the head, position mask as desired, then release red handles.
(4) Ensure that mask is properly sealed. Reposition mask if required.

With the 100% lever extended and PRESS TO TEST button/knob rotated to the ▬ position, the mask will deliver automatic oxygen from sea level to 30,000 feet cabin altitude, 100% oxygen above 30,000 feet cabin altitude, and automatic pressure breathing above approximately 37,000 feet cabin altitude. To obtain 100% oxygen at any time, depress 100% lever on mask regulator. For emergency operation, select EMERGENCY (rotate PRESS TO TEST button/knob to ●). With the mask pressure regulator controls in this position the crew mask will deliver 100% oxygen at all cabin

altitudes and maintain a positive pressure in the mask cup at all times for respiratory protection from smoke or fumes.

3.0.5 Normal Procedures Checklist

According to the Learjet 35/36 Airplane Flight Manual, "Normal preflight procedures (all checklist line items) must be accomplished prior to takeoff at the original departure point of a flight. At each intermediate stop of flight where both engines are shutdown, the Through-Flight Checklist may be used for preflight provided certain criteria are met during a stop. Procedures on the checklist marked with the symbol (♦) denote Through-Flight Checklist items.

The following items pertaining to the oxygen system are listed in The EXTERIOR PREFLIGHT procedure: "Oxygen Bottle Supply Valve (if applicable) – Open (On);" "Oxygen Discharge Disc (if applicable) – Condition." Neither of these items is marked with the symbol (♦). According to the FAA Principal Operations inspector[22] assigned to the Sunjet Aviation certificate, labeling on the oxygen bottle supply valve is misleading; the word "off" is visible when the valve is open.

According to the Sunjet Aviation Chief Pilot,[23] during the exterior preflight, "it would not be impossible to confuse the on/off status of the oxygen system because it is not marked the way it should be marked." He stated that he went over that with the accident captain during training. He stated that pilots at Sunjet Aviation never turn the oxygen system off; it is emphasized during preflight training. Further, it is not company procedure to disconnect the crew oxygen masks.

Briefing the passengers is a required item in the "Cabin Preflight" section of the Airplane Flight Manual. Among other things, the briefing includes oxygen system operation.

As required by the BEFORE STARTING ENGINES checklist, the oxygen system must be set/checked as follows:

a. PASS MASK Valve – AUTO
b. PASS OXY Valve – NORM[24]
c. OXYGEN PRESSURE Gauge – Check
d. Crew Masks:
   (1) Check oxygen flow available. Select 100% oxygen.

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[22] See Attachment 1-15.
[23] See Attachment 1-23.
[24] With the PASS OXY Valve in the NORM position, oxygen is available to the passenger oxygen distribution system. With the PASS OXY Valve in the NORM position and the PASS MASK Valve in AUTO, the passenger oxygen masks will drop from their storage compartments if the cabin altitude reaches 14,000 feet. When oxygen masks fall from their storage compartments, passengers must don the mask and pull the lanyard (releases oxygen to the mask).

Only item "c" is marked with the symbol (♦).

Warning system checks are also included in the BEFORE STARTING ENGINES checklist. The checklist item, "Cabin Altitude Warning – Check:" includes the following:

(5) TEST Selector Switch – Rotate to CABIN ALT, then depress and hold TEST button. Cabin altitude warning horn shall sound.
(6) HORN SILENCE Switch – Momentarily engage. Cabin altitude warning shall cease.
(7) TEST Button – Release.

None of these items is marked with the symbol (♦).

The checklist calls for the pressurization controls to be checked and set as follows:

(1) L and R BLEED AIR Switches – Check, On.
(2) CABIN AIR Switch – OFF.
(3) PRESSURIZATION AUTO-MAN Switch – AUTO.
(4) AIRCRAFT ALT Selector Knob – Rotate to cruise altitude.
(5) Cabin RATE Selector – Position as desired.
(6) IN NORMAL-OUT DEFOG Knob – Push in.

Only item "(4)" is marked with the symbol (♦).

The TAXI AND BEFORE TAKEOFF checklist includes the following items:

18. Pressurization System – Set.
19. CABIN AIR Switch – NORM.

Both of these items are marked with the symbol (♦).

The AFTER TAKEOFF checklist includes the following item:

6. Pressurization System:
   a. Cabin Altitude and cabin Climb Indicators – Monitor.
   b. Cabin RATE Selector – As desired.

This item is not marked with the symbol (♦).

The CLIMB checklist includes the following item as a check to be made when climbing through 18,000 feet:

4. Crew Masks – Positioned to quick donning position at or before FL 250.

This item is not marked with the symbol (♦).

3.0.6 Abnormal Procedures Checklist

According to the Learjet 35/36 Airplane Flight Manual ABNORMAL PROCEDURE for a pressurization loss at altitude, the following must be accomplished:

Up to 10,000 (±500) Feet Cabin Altitude

1. Oxygen Masks – Don.
2. Engine RPM – Maintain.
3. IN NORMAL/OUT DEFOG Knob – Push in.
4. WSHLD HEAT Switch – AUTO.
5. CABIN AIR Switch – OFF.
6. AUTO MAN Switch – MAN.
7. UP DN Manual Control (red) – As required to maintain satisfactory pressurization.

At 10,000 (±500) Feet Cabin Altitude

1. Cabin altitude aural warning horn will sound.

NOTE: At 10,000 (±500) Feet Cabin Altitude, control pressure to the outflow valve is trapped. This deactivates the Automatic Mode and stops cabin altitude from rising higher if the failure is in the automatic control system.

2. If cabin pressurization cannot be maintained, execute EMERGENCY DESCENT[25] as follows:

   a. Oxygen Masks – Don. Select 100% oxygen.
   b. Thrust Levers – Idle.
   c. Autopilot – Disengage.
   d. Spoiler Switch – EXT.
   e. LANDING GEAR Switch – DN below M_{MO} or V_{LE} as appropriate for altitude. Keep sideslip angles to a minimum

[25] Items "a" through "f" are to be accomplished by the pilot without the aid of the Airplane Flight Manual. These are commonly called memory items.

(ball centered) when extending landing gear.

f. Descend at M_{MO} or V_{LE} as appropriate for altitude. Descent from 45,000 feet to 15,000 feet requires approximately 2 minutes, 45 seconds.

4.0 COMPANY INFORMATION

4.0.1 Company History

According to James A. Watkins, Sunjet Aviation was a diversified aviation company founded in 1992. The company operated a "fixed base operation" providing fuel, catering, aircraft detailing, ground transportation and hotel accommodation arrangements.

The company was certified by the FAA as a Part 135 jet charter operator specializing in Learjets and Citation jets. The company operated a total of six airplanes. According to FAA records, the Sunjet Aviation operating certificate had an issue date of February 12, 1996.

The company also operated a certified maintenance repair station, including an interior refurbishing shop.

Sunjet Aviation also managed aircraft for other corporations and had an aircraft sales division, including a fractional ownership program.

The company employed 70 people.

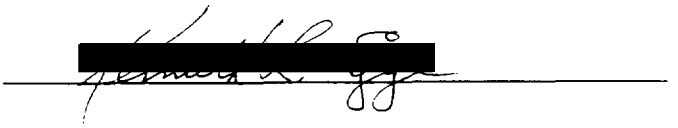
5.0 FAA SURVEILLANCE

The current Principal Operations Inspector[26] (POI) was assigned to the Sunjet Aviation certificate on October 1998. He holds a Learjet type rating that he received in 1989. He stated that he had attended some of Sunjet Aviation's pilot training sessions, but on a limited basis. He stated that he had not flown on a Sunjet Aviation airplane, but he was aware that another FAA inspector who was current and qualified on the Learjet had flown on the company's airplanes and monitored training courses as well. The POI stated that he does not give pilot checkrides; instead there is an approved designated pilot examiner who performs this function.

The POI stated that his responsibility included approval for training, procedures, and company manuals. He stated that he had accomplished a "spot inspection" last spring but did not find any problem areas. In the year preceding the accident, at his request, Sunjet Aviation had "upgraded" all of the manuals except for the General Operations Manual.

[26] See Attachment 1-19.

Submitted by:



Kenneth L. Egge
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E. LIST OF ATTACHMENTS