PB96-9104O7
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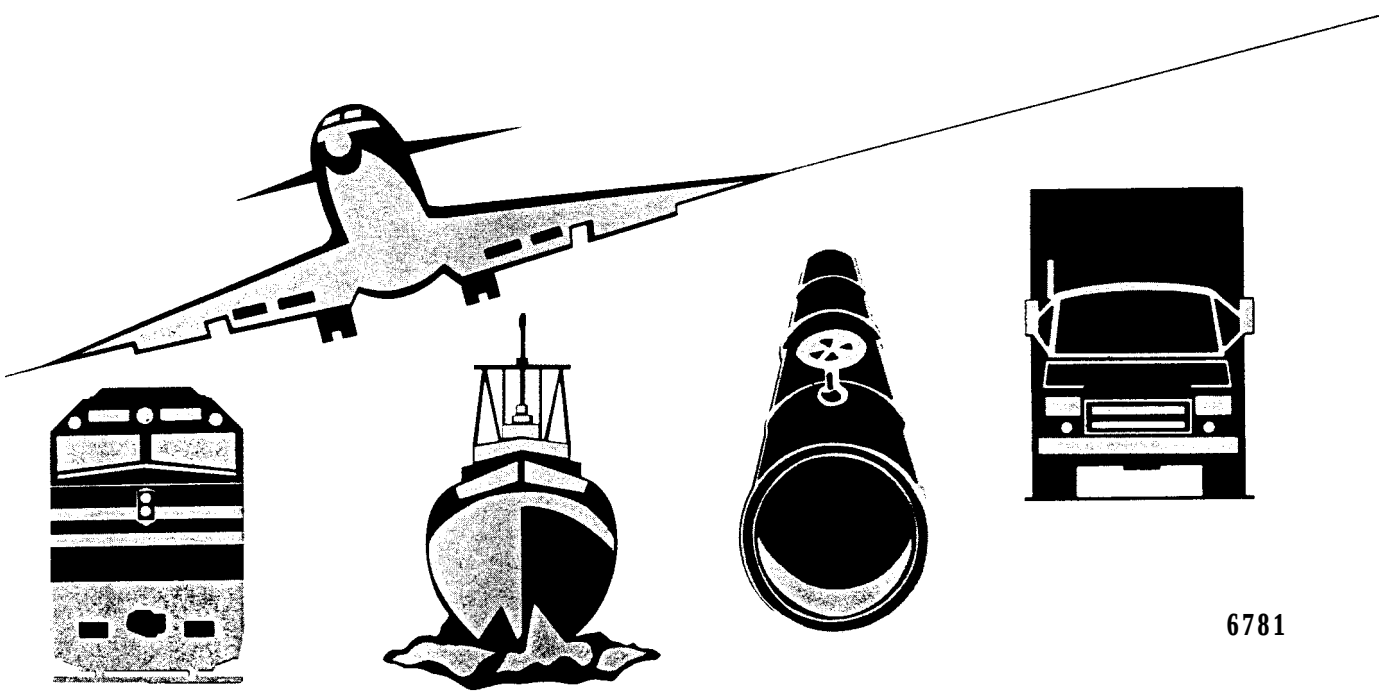
NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

GROUND SPOILER ACTIVATION IN FLIGHT/HARD LANDING
VALUJET AIRLINES FLIGHT 558
DOUGLAS DC-9-32, N922VV
NASHVILLE, TENNESSEE
JANUARY 7, 1996



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JANUARY 7,1996

Adopted: December 11, 1996
Notation 6781

Abstract: This report explains the ground spoiler activation in flight and subsequent hard landing of ValuJet Airlines flight 558, N922VV, a Douglas DC-9-32 at Nashville International Airport, Nashville, Tennessee. The safety issues discussed in the report include the adequacy of ValuJet's operations and maintenance manuals, specifically winter operations nosegear shock strut servicing procedures; the adequacy of ValuJet's pilot training/crew resource management training programs; flightcrew actions/decisionmaking; the role of communications (flightcrew/flight attendants/ operations/dispatch/air traffic control); ValuJet's flightcrew pay schedule; Federal Aviation Administration (FAA) oversight of ValuJet; and the adequacy of cockpit voice recorder **(CVR)** duration and procedures. Safety recommendations concerning these issues were made to the FAA and ValuJet Airlines.

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CONTENTS

ABBREVIATIONS

agl: above ground level, 7

AIM: Aeronautical Information Manual, 8

AOL: all operator letter, 14

AOM: aircraft operating manual, 1

APU: auxiliary power unit, 1

ARFF: aircraft rescue and fire fighting, 8

ATC: air traffic control, 7

ATIS: automatic terminal information service, 6

ATP: airline transport pilot, 11

CAM: cockpit area microphone, 19

CDL: configuration deviations list, 13

CFR: Code of Federal Regulations, 1

COM: company operating manual, 4

CRM: crew resource management, 11

CVR: cockpit voice recorder, 18

EPR: engine pressure ratio, 20

FAA: Federal Aviation Administration, 2

FAR: Federal Aviation Regulation, 22

FCOM: flightcrew operating manual, 6

FDR: flight data recorder, 18

FSDO: flight standards district office, 13

FSI: Flight Safety International, 24

G: vertical acceleration force, 19

IFR: instrument flight rules, 1

ILS: instrument landing system, 6

IOE: initial operating experience, 24

LOS: line operational simulation, 28

MEL: minimum equipment list, 13

msl: mean sea level, 4

P&W: Pratt & Whitney, 13

PA: public address, 10

PMI: principal maintenance inspector, 12

POI: principal operations inspector, 12

psi: pounds per square inch, 6

QRH: quick reference handbook, 2

SB: service bulletin, 14

SN: serial number, 13

VMC: visual meteorological conditions, 1

EXECUTIVE SUMMARY

About 1620 central standard time, on January 7, 1996, a Douglas Aircraft Company DC-9-32, N922VV, operated by ValuJet Airlines, Inc., as flight 558, touched down hard in the approach light area short of runway 2R at the Nashville International Airport in Nashville, Tennessee. Flight 558 was operating under the provisions of Title 14 Code of Federal Regulations Part 121, as a scheduled, domestic passenger flight from Atlanta, Georgia, to Nashville. The flight departed the William B. Hartsfield Atlanta International Airport at approximately 1540, with five crewmembers and 88 passengers on board. The flight attendant who occupied the rear cabin jumpseat and four passengers reported minor injuries; no injuries were reported by the remaining 88 occupants. The airplane sustained substantial damage to the tail section, nosegear, aft fuselage, flaps, slats, and both engines. Visual meteorological conditions prevailed for the flight, which operated on an instrument flight rules flight plan.

The National Transportation Safety Board determines that the probable cause of this accident was the flightcrew's improper procedures and actions (failing to contact system operations/dispatch, failing to use all available aircraft and company manuals, and prematurely resetting the ground control relay circuit breakers) in response to an in-flight abnormality, which resulted in the inadvertent in-flight activation of the ground spoilers during the final approach to landing and the airplane's subsequent increased descent rate and excessively hard ground impact in the runway approach light area.

Contributing factors in the accident were ValuJet's failure to incorporate cold weather nosegear servicing procedures in its operations and maintenance manuals, the incomplete procedural guidance contained in the ValuJet quick reference handbook, and the flightcrew's inadequate knowledge and understanding of the aircraft systems.

The safety issues discussed in this report include the adequacy of ValuJet's operations and maintenance manuals, specifically winter operations nosegear shock strut servicing procedures; the adequacy of ValuJet's pilot training/crew resource management training programs; flightcrew actions/decisionmaking; the role of communications (flightcrew/flight attendants/operations/dispatch/air traffic control); ValuJet's flightcrew pay schedule; Federal Aviation Administration oversight of ValuJet; and the adequacy of cockpit voice recorder duration and procedures.

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AIRCRAFT ACCIDENT REPORT

GROUND SPOILER ACTIVATION IN FLIGHT/HARD LANDING VALUJET AIRLINES FLIGHT 558, DOUGLAS DC-9-32, N922VV NASHVILLE INTERNATIONAL AIRPORT NASHVILLE, TENNESSEE JANUARY 7, 1996

1. FACTUAL INFORMATION

1.1 History of Flight

About 1620 central standard time,[1] on January 7, 1996, a Douglas Aircraft Company (Douglas) DC-9-32, N922VV, operated by ValuJet Airlines, Inc., as flight 558, touched down hard in the approach light area short of runway 2R at the Nashville International Airport in Nashville, Tennessee. Flight 558 was operating under the provisions of Title 14 Code of Federal Regulations (CFR) Part 121, as a scheduled, domestic passenger flight from Atlanta, Georgia, to Nashville. The flight departed the William B. Hartsfield Atlanta International Airport at approximately 1540, with five crewmembers and 88 passengers on board. The flight attendant who occupied the rear cabin jumpseat and four passengers reported minor injuries; no injuries were reported by the remaining 88 occupants. The airplane sustained substantial damage to the tail section, nosegear, aft fuselage, flaps, slats, and both engines. Visual meteorological conditions (VMC) prevailed for the flight, which operated on an instrument flight rules (IFR) flight plan.

The accident occurred on the third leg of the day for the DC-9 flightcrew. The captain flew the first leg of the day, from Atlanta to Indianapolis, Indiana. According to the captain, the first leg's departure from Atlanta was delayed for more than an hour because of maintenance on the auxiliary power unit (APU) generator and deicing operations. The first officer performed pilot flying duties for the second leg, which was the return flight from Indianapolis to Atlanta. The flightcrew described the second leg of the trip sequence as routine.

The captain told investigators that upon arrival in Atlanta after the second leg, he went to ValuJet system operations to pick up the paperwork for the third leg of the trip sequence. When the captain returned to the DC-9, he performed the exterior preflight inspection of the airplane. He stated that this inspection of the airplane was normal, and he did not notice any landing gear anomalies; specifically, the captain indicated to investigators that the nosegear strut inflation appeared normal. The ValuJet aircraft operating manual (AOM) states that during the

[1] Unless otherwise indicated, all times are central standard time, based on a 24-hour clock.

exterior inspection of the airplane, the flightcrew should check the nosegear strut for inflation and leaks and includes a note indicating that "Normal strut extension is 2 to 6 inches."[2]

While the captain performed the exterior preflight inspection, the first officer, who performed pilot flying duties for the third leg, completed the weight and balance paperwork and performed the interior preflight inspection of the airplane. According to the company, flight 558 was originally scheduled to depart Atlanta for Nashville at 1355; however, in part because of the delays before departure from Atlanta on the first leg of the trip, flight 558 did not leave the gate at Atlanta until 1525.

The pilots reported that the engine start and taxi from the gate were normal. Because of the amount of ice and snow they encountered as they taxied to runway 26L, the pilots were concerned that the aircraft's surfaces/components would get contaminated during taxi.

At approximately 1539, flight 558 was cleared for takeoff on runway 26L. The flightcrew stated that the takeoff roll and rotation were normal. The pilots reported that after the captain announced a positive rate of climb, the first officer requested "...gear up." The captain attempted to raise the landing gear lever to the retract position, but the lever would not move beyond the uplock check position.[3]

In accordance with the procedures outlined in the Federal Aviation Administration (FAA)-approved ValuJet quick reference handbook (QRH), Page A-38,[4] (see figure 1) entitled "Unable to Raise Gear Lever,"[5] the captain attempted to turn the nosewheel steering wheel located at his left side. The nosewheel steering tiller did not turn, which confirmed that the nosewheel steering was centered and locked. According to the QRH, this indicated a

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[2] Douglas representatives stated that they would not expect flightcrew members to reliably detect underserviced/underinflated nosegear shock struts during the strut extension examination performed during their aircraft preflight inspection because the visible indications of such a condition are very subtle and are dependent on aircraft load conditions. Douglas representatives stated that reliable detection of underserviced/underinflated nosegear shock struts is accomplished by comparing the strut pressure and the "X" dimension (amount of visible chrome plate on the piston) with the "strut inflation curve." This inspection/comparison is identified as an item "normally accomplished by maintenance."

[3] Further description of the landing gear lever positions is included in section 1.6.1, "Landing Gear System."

[4] Excerpts from the QRH and other ValuJet and Douglas manuals are included in appendix E.

[5] Throughout the ValuJet manuals, the term "landing gear lever" is used instead of the Douglas term "landing gear handle."

UNABLE TO RAISE GEAR LEVER

NOSE STEERING WHEEL ..... OPERATE (C)

If steering wheel does NOT turn and centering indices are aligned:

Indicates a malfunction of the anti–retraction mechanism.

If desired, retract landing gear:

GEAR HANDLE RELEASE BUTTON ..... PUSH (PNF)

GEAR LEVER ..... UP (PNF)

If steering wheel turns:

DO NOT RETRACT THE GEAR

Indicates ground shift mechanism is still in the ground mode.

No auto–pressurization, and takeoff warning horn will sound when flaps/slats are retracted.

The ground control relay electrical circuits can be placed in the flight mode by pulling the Ground Control Relay circuit breakers (H20 and J20).

Do not exceed VLE (300 kts/M.70).

Approach and landing:

If landing gear was not retracted prior to landing, ground spoilers must be operated manually.

AIRPLANE ..... DEPRESSURIZE (PNF)

ANTI–SKID SWITCH (before 30 kts) ..... OFF (PNF)

GROUND CONTROL RELAY C/Bs (if pulled)
(H20 and J20) ..... RESET (C or FO)

Figure 1—ValuJet QRH, Page A-38

malfunction of the landing gear anti-retraction mechanism.[6] The pilots, proceeding in accordance with the QRH, pushed the landing gear handle release button and raised the landing gear lever again; this time the landing gear retracted.

The flightcrew retracted the flaps and slats and adjusted the throttles for initial climb. The captain assumed flying duties and requested that the first officer review the QRH to verify that all required procedures for raising the gear lever had been accomplished. The first officer confirmed that they had completed the procedures correctly.

As the DC-9 climbed through 4,000 feet mean sea level (msl), the captain advanced the throttles to normal climb power and called for the "Climb" checklist. At this point, the takeoff warning horn sounded,[7] and the first officer noted that the cabin was not pressurizing. The flightcrew referred to the QRH again and determined that in addition to the landing gear anti-retract mechanism malfunction, the ground shift mechanism must have malfunctioned.[8] Specifically, the ValuJet QRH, page A-38, indicated that if the ground shift mechanism was still in the ground mode, there would be "No auto-pressurization, and takeoff warning horn will sound when flaps/slats are retracted." The QRH further stated, "The ground control relay electrical circuits can be placed in the flight mode by pulling the Ground Control Relay circuit breakers (H20 and J20)." The pilots stated that when the first officer pulled the ground control relay circuit breakers (H20 and J20), the takeoff warning horn silenced, and the cabin began to pressurize. The flightcrew completed the "Climb" checklist without further incident.

As the DC-9 climbed through 10,000 feet msl, the captain engaged the autopilot and transferred control of the airplane back to the first officer. According to the pilots, they discussed the problems they had encountered and considered their options as they continued the climbout after departure. ValuJet's company operating manual (COM) states that pilots shall report all incidents and/or irregularities[9] to company system operations/dispatch at the earliest opportunity. The pilots indicated that they did not contact ValuJet system operations/

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[6] According to the ValuJet DC-9 AOM, the "anti-retraction mechanism prevents moving the [landing gear] lever more than 2 inches out of the DOWN position until the nose gear strut extends, actuating the ground shift mechanism."

[7] According to the ValuJet DC-9 AOM, an intermittent warning horn will sound when the aircraft is in the ground mode, if throttles are advanced at least 2 1/8 inches forward of idle stops, as if for takeoff, and if the flaps are not set at 5^{o} or 15^{o}. The horn will not sound under similar circumstances, if the aircraft is in flight mode.

[8] For additional information on the ground shift mechanism, see section 1.6.1, "Landing Gear System," and figure 2.

[9] On pages 7-7 through 7-9 of the ValuJet COM, reportable incidents/irregularities are listed. Page 7-8 states that any mechanical or communication malfunction should be reported to ValuJet system operations by radio. These pages are included in appendix E.

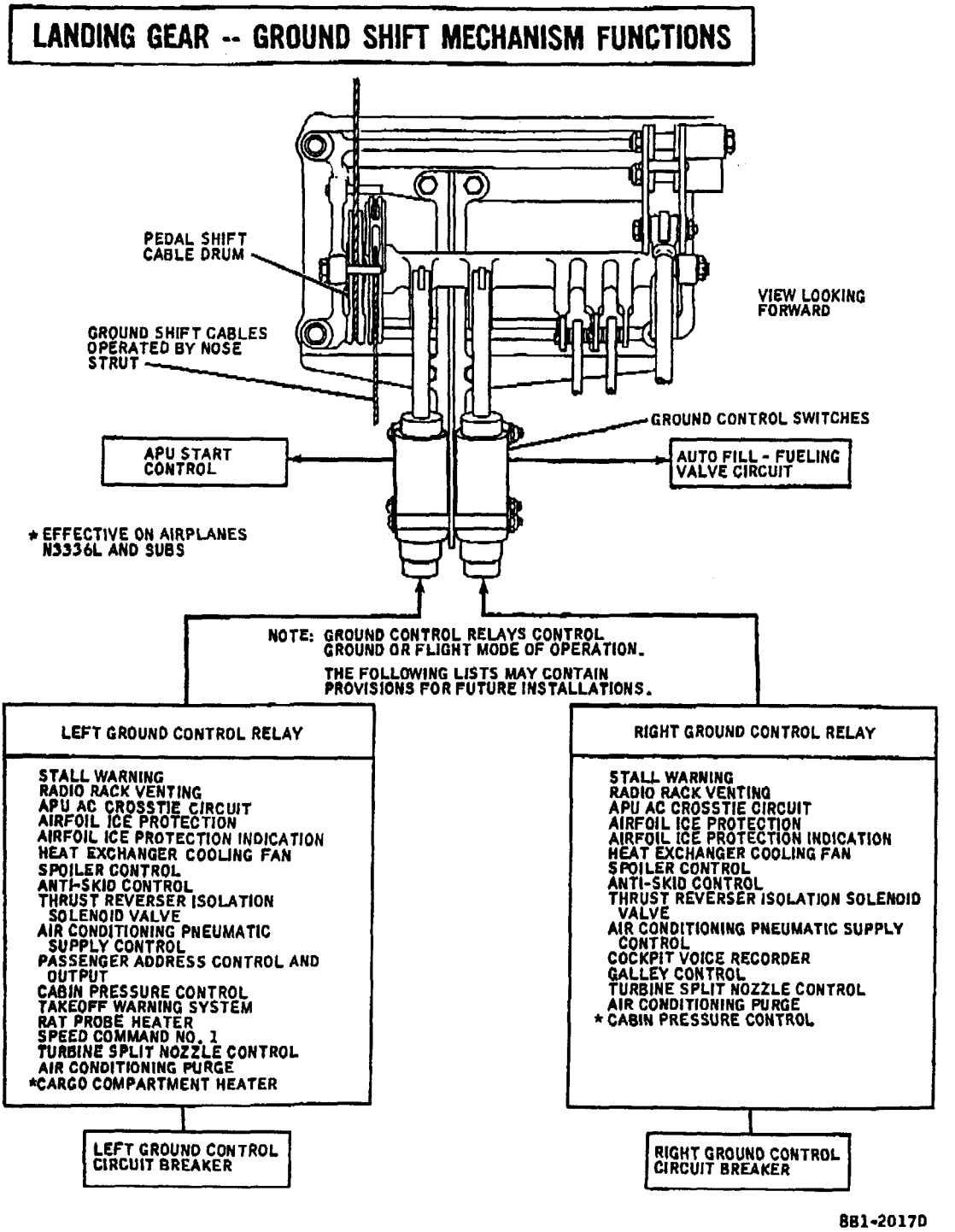

Figure 2—DC-9 Ground Shift Mechanism

dispatch about the events that occurred during their departure from Atlanta because they believed that the ice and snow on the ground in Atlanta might have contaminated the ground shift mechanism. They stated that they believed that they had resolved the problem, and the airplane appeared to be flying safely and normally. The pilots also believed that it was safe to continue the flight to Nashville and said that they planned to have the contract maintenance personnel[10] at Nashville examine the airplane after landing.

The pilots indicated that the flight to Nashville proceeded normally, and during the en route portion of the flight, they discussed the procedures they should use during the approach and landing in Nashville. The flightcrew consulted the guidance in the QRH, page A-38, "Unable to Raise Gear Lever," under the subheading "Approach and landing."[11] The pilots decided to depressurize the cabin during the descent with the automatic pressurization system. The pilots reported that although the automatic pressurization system appeared to be functioning normally, they were concerned that there might be a slight "bump" in pressurization after landing, caused by the venting of cabin pressure after touchdown.[12] The pilots decided that they could preclude such a loss of cabin pressurization after landing by resetting the ground control relay circuit breakers just before touchdown. They believed that resetting the circuit breakers on short final approach would also satisfactorily accomplish the third QRH approach and landing checklist item.[13] (Refer to figure 1.)

According to the pilots, as they approached Nashville, they performed the normal "Descent and Approach" checklist and obtained the current automatic terminal information service (ATIS) for Nashville. The ATIS reported VMC and surface winds out of the northwest at 12 knots, with gusts to 20 knots, at Nashville. In accordance with the COM, the first officer elected to fly the instrument landing system (ILS)/transition to visual approach to runway 2R at

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[10] ValuJet uses contract maintenance facilities for scheduled and unscheduled maintenance away from its primary maintenance bases in Atlanta and at Dulles International Airport, Washington, D.C. ValuJet's contract maintenance organization for Nashville was Northwest Airlines.

[11] The guidance provided in this section of the QRH is quoted in full in section 1.17.2.1 of the narrative. A copy of page A-38 of the QRH is included in appendix E.

[12] According to the Douglas flightcrew operating manual (FCOM), if the DC-9 automatic pressurization system was operating normally during the descent and approach, and the differential pressure indicator indicated zero pounds per square inch (psi) as the aircraft approached the runway, there would be no pressurization anomaly upon touchdown. Also, the DC-9 has a manual pressurization control, which may be employed by selecting the manual control position with the cabin pressure controller lever, located on the right side of the throttle console. This allows the flightcrew to manually position the cabin outflow valves, located in the lower aft section of the airplane and, thus, manually control cabin pressurization.

[13] The ValuJet AOM, which provides more detailed procedural guidance than the QRH for abnormal operations (including "Unable to Raise Gear Lever"), describes the third step under "Approach and landing" as follows: "Reset Ground Control Relay circuit breakers **during taxi** [emphasis added] and verify that circuits are in the ground mode."

an airspeed about 10 knots higher than the calculated approach airspeed to compensate for the gusty crosswind during the approach and landing.

As the DC-9 descended on the ILS approach, the flightcrew performed the normal "Before Landing" checklist, which included arming the spoilers, extending the flaps/slats, and extending the landing gear. The flightcrew stated that the landing gear extended normally, and flaps were set at 50^{o} (fully extended) for landing.

The first officer told investigators that when the DC-9 was about 100 feet above ground level (agl), the captain verified a zero psi differential on the cabin differential pressure gauge and reset the ground control relay circuit breakers. According to the first officer, he noted that the cabin outflow valve began to move to the full open position, and then he heard the sound of the ground spoilers deploying as the airplane began to descend at an excessive rate. The first officer reported that he shouted "ground spoilers!" and attempted to arrest the excessive sink rate with back pressure on the control column and the addition of full power.[14]

At approximately 1620, the DC-9 struck the runway approach light area tail first, followed by main landing gear and nosegear, with engine thrust increasing. The nosewheel tires and rims separated after ground impact,[15] and then the airplane became airborne again. The captain assumed control of the airplane as it became airborne and established a climb on runway heading. The first officer raised the flaps to 15^{o}, which positioned the flaps for the climb. Because of possible impact damage, the flightcrew decided not to retract the flaps/slats any further and to leave the landing gear extended during the go-around.

As the pilots performed the go-around procedure, the first officer noticed that the No. 2 (first officer's) navigation and communication radios were unusable. The captain then attempted to contact air traffic control (ATC) using the No. 1 (captain's) communication radio but was unsuccessful.[16] Because the first officer was unable to use the navigation radio to perform the published missed approach procedure, the pilots agreed that they should remain in VMC and return to land at Nashville as soon as possible. They planned to land on runway 31 because it was closest to their position and because they knew it was operational from the ATIS broadcast they had received during their first approach. The pilots indicated to investigators that they did not have time to brief the flight attendants during the go-around. Because the flightcrew

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[14] According to the ValuJet AOM, the ground spoilers automatically retract and disarm if the left throttle is moved forward from the idle position stop.

[15] The flightcrew stated that it was not aware of the damage to the nose landing gear.

[16] Postaccident examination revealed that the No. 1 communication radio switch was in an intermediate (unpowered) position, which resulted in the No. 1 communication radio's failure to operate during the go-around. Additionally, the right DC bus reverse current relay, which provides power to the No. 2 navigation and communication radios, was "open," which resulted in the No. 2 communication and navigation radios' failure to operate during the go-around. The right DC bus reverse current relay is mounted on the inside of the aft wall of the nose wheel well.

was unable to communicate by radio with the Nashville ATC tower, the first officer tuned the airplane's transponder to 7700/7600, in accordance with lost communication procedures.[17]

Nashville ATC personnel stated that they observed debris from the DC-9 at the approach end of runway 2R after the airplane struck the ground during the first landing attempt, and they were aware that the airplane nosegear was damaged from the impact. Although the air traffic controllers attempted to advise the flightcrew of the damage, they were unable to reestablish radio communication with flight 558. At approximately 1623, ATC personnel contacted the aircraft rescue and fire fighting (ARFF) facility to advise it that they were unable to communicate with a DC-9 that would probably be returning to land with landing gear problems.[18]

Meanwhile, the pilots continued the approach to runway 31. The captain was flying the airplane, while the first officer advised the captain of their relative position to runway 31 and the length of the runway and briefed the approach. The pilots completed the "Before Landing" checklist, and the first officer extended flaps and slats for landing. The pilots decided not to arm the spoilers for landing because they planned to manually deploy the ground spoilers during the landing roll. As they approached the runway, the pilots observed emergency equipment with flashing lights moving into position near runways 2R and 31. (See figure 3, "Airport Diagram.")

At approximately 1628, the airplane touched down on its main landing gear on the centerline of runway 31. The first officer deployed the ground spoilers manually, and the captain applied the thrust reversers. Both pilots stated that they heard a loud grinding noise when the nosegear touched down on the runway centerline. The noise continued throughout the landing roll, and the airplane began to drift to the left of the runway centerline. The captain corrected for the left drift with brakes, and the airplane came to a stop about 5,800 feet from the approach end of runway 31.

When the airplane came to a stop, the flightcrew performed the "After Landing" checklist and shut down the engines normally. The captain informed the flight attendants and

[17] According to the FAA Aeronautical Information Manual (AIM), if radio communications are lost, the pilot should tune the aircraft transponder to code 7700 to indicate an urgent or distress situation to ATC, then tune the transponder to code 7600 to indicate a loss of radio communications.

[18] The ATC transcript is included in appendix D.

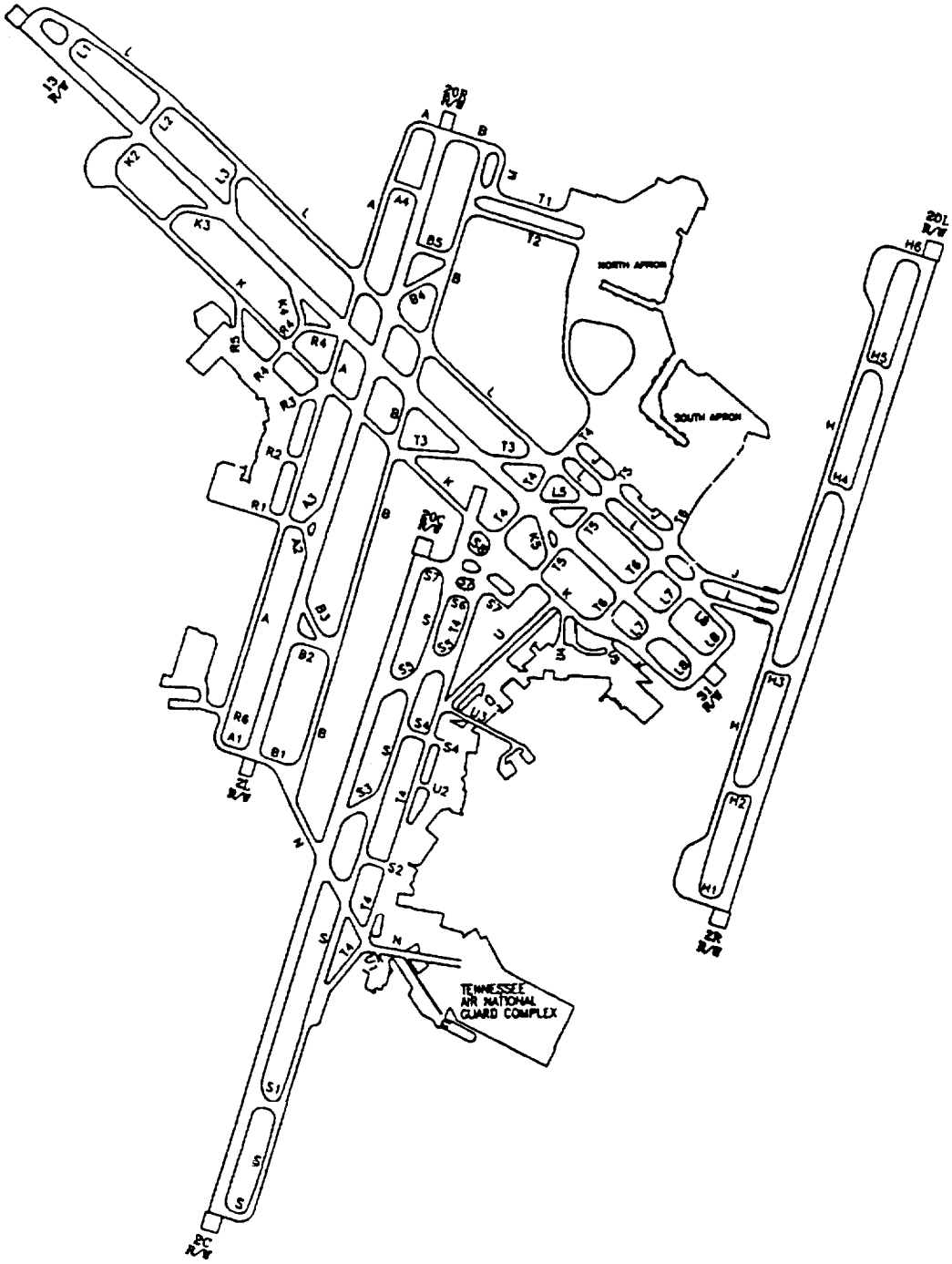

Figure 3—Nashville International Airport Diagram

passengers via the public address (PA) system that a flight control malfunction had occurred, that the airplane was safely stopped with emergency equipment standing by, and that the pilots were requesting ground transportation from the airplane to the terminal. He instructed the passengers to remain seated until further advised. The first officer opened the right side cockpit window and asked the ARFF personnel if any risk was involved in remaining on board the airplane. ARFF personnel advised the pilots that there was no evidence of fuel leaks, smoke, or fire, and the airplane appeared to be safe for continued occupancy.

Approximately 20 minutes after the airplane came to a stop, buses arrived to transport the passengers to the terminal building. The passengers deplaned via the left front airstair and were bused to the terminal. The pilots secured the airplane and were transported to the terminal in an emergency response vehicle.

The accident occurred at dusk, at approximately 36°, 7 minutes, 6 seconds North latitude and 86°, 40 minutes, 9 seconds West longitude.

1.2 Injuries to Persons

Injuries	Flightcrew	Cabin Crew	Passengers	Other	Total
Fatal	0	0	0	0	0
Serious	0	0	0	0	0
Minor	0	1	4	0	5
None	2	2	84	0	88
Total	2	3	88	0	93

1.3 Damage to Airplane

The DC-9 received substantial damage to its tail section, nosegear, aft fuselage, slats, flaps, and both engines.

1.4 Other Damage

Two runway approach system lights and two runway threshold lights on runway 2R were damaged when the airplane struck terrain on the approach light portion of the runway. The surface of runway 31 was also damaged.

1.5 Personnel Information

The flightcrew consisted of the captain and the first officer. The trip sequence on the day of the accident was the first time the captain and first officer had flown together. The cabin crew consisted of three flight attendants.

1.5.1 The Captain

The captain, age 43, was hired by ValuJet in November 1994 as a first officer on the DC-9 airplane.[19] He was upgraded to captain on the DC-9 in December 1995. He held an airline transport pilot (ATP) certificate, with airplane single-engine and multiengine ratings, and a DC-9 type rating.

The captain's first-class medical certificate was issued on September 25, 1995, with no restrictions or limitations. According to company records, the captain completed ValuJet's crew resource management (CRM) course on April 14, 1995. The captain's most recent proficiency check was completed on December 6, 1995, in the DC-9 airplane in conjunction with his upgrade to captain. A review of his captain upgrade training records indicated that the captain flew 25.8 hours of initial operating experience, all under 14 CFR Part 121. Records indicated that at the time of the accident, the captain had accumulated 4,381 total flight hours, including 1,061 hours in the DC-9, with 26 hours as a DC-9 captain. The captain's total flight hours included 3,320 flight hours in military aircraft.

The captain's written statement indicated that his aviation background began in the U.S. Navy in 1975, and he was designated a naval aviator in 1976. He indicated that from 1976 to 1978 he was assigned as a standardization flight instructor in the North American T-28. Between 1978 and 1982, the captain flew the Lockheed P-3 with a patrol squadron.[20] In 1982, the captain left active duty and joined the naval reserve. Between 1982 and 1991, the captain served with a naval reserve patrol squadron as plane commander, mission commander, and maintenance check pilot in the Lockheed P-3. The captain left the naval reserve patrol squadron in August 1991. According to the captain's résumé, he worked for Lockheed Missiles & Space Company as a systems/logistics engineer between 1982 and 1993. The captain's résumé indicated that he was employed as an associate builder/residential construction when he applied for employment as a first officer at ValuJet.

The captain had been off duty for 3 days before the day of the accident. On the day of the accident, he reported for duty at about 0915. He flew two flight legs with the first officer before the accident flight leg and had accumulated 5 hours 30 minutes of flight time and 7 hours 5 minutes of duty time at the time of the accident.

1.5.2 The First Officer

The first officer, age 42, was hired by ValuJet in October 1995 as a first officer on the DC-9 airplane. He held an ATP certificate with airplane multiengine land ratings, an instrument rating, and DC-9, Gulfstream G-1159, Cessna 500, Falcon 10, Falcon 20, and Falcon 50 type ratings. He had commercial pilot privileges for airplane single-engine land and sea.

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[19] The captain of ValuJet flight 558 was the first officer on ValuJet flight 597, which incurred an uncontained engine failure/fire on June 8, 1995. The Safety Board investigated the accident and issued its findings in report NTSB/AAR-96/03.

[20] The North American T-28 is a two-seat, reciprocating engine-powered training aircraft. The Lockheed P-3 is a Navy antisubmarine patrol airplane equipped with four turbopropeller engines.

His first-class medical certificate was issued on June 1, 1995, and contained the limitation, "Holder must wear corrective lens while flying." Training records indicate that the first officer completed ValuJet CRM training in September 1995 with his initial hire training. A review of the first officer's initial operating experience training records indicated that he flew 27 hours of initial operating experience, all under 14 CFR Part 121. The first officer's last proficiency check was completed on October 11, 1995, in the DC-9 airplane. According to company records, he had accumulated about 7,707 total flight hours, with 205 hours in the DC-9, all as first officer.

The first officer reported that he had more than 20 years flight experience, of which more than 17 years and 5,500 flight hours were in multiengine turbojet aircraft.

The first officer was off duty on January 3 and January 4. On January 5, he accumulated about 6 hours of flight time and about 8 hours of duty time. On January 6, he accumulated about 4½ hours of flight time and about 6 hours of duty time. He reported for duty at about 0915 on the day of the accident. He had accumulated 5 hours 30 minutes of flight time and 7 hours 5 minutes of duty time at the time of the accident.

1.5.3 Flight Attendants

Two flight attendants occupied the aft-facing double-occupancy jumpseat in the forward cabin at the time of the accident. The other flight attendant was seated in the forward-facing rear cabin jumpseat. All three flight attendants had satisfactorily completed ValuJet's flight attendant training program.

1.5.4 FAA Principal Operations Inspector (POI) for ValuJet

The POI was hired by the FAA in September 1989 as a geographic air carrier inspector. He spent approximately 1 year in that position and then transferred to certificate management in 1990. At various times from 1990 through the time of the accident, he managed the certificates of five Part 121 air carriers (including ValuJet) and three Part 135 air carriers. He was the project manager for ValuJet's certification and then became the POI when ValuJet began operations in October 1993. In September 1995, the FAA reassigned all non-ValuJet certificate responsibilities to other inspectors. At the time of the accident, the ValuJet certificate was the only certificate assigned to the POI.

The POI had more than 32 years of aviation experience at Eastern Airlines before he was hired by the FAA. He had been hired by Eastern Airlines in December 1956 and worked as first officer, flight engineer, and captain. He had been a captain on the Convair 330/440, L188 (Lockheed Electra), DC-9, Boeing 727, Boeing 757/767, Airbus A300, and Lockheed L1011.

1.5.5 FAA Principal Maintenance Inspector (PMI) for ValuJet

The PMI was hired by the FAA in August 1989 as the accident investigation and enforcement program coordinator in the FAA's Southern Regional Office. In December 1992, he

transferred to an aviation safety inspector/quality specialist position in the Atlanta Flight Standards District Office (FSDO), where he began certificate management duties in December 1993. The PMI was assigned to manage ValuJet's certificate in December 1994 and held that assignment until August 1996. Between November 1994 and February 1996, the PMI also managed a second Part 121 operator.

The PMI had more than 25 years of aviation experience before he was hired by the FAA. He had been a maintenance officer in the U.S. Air Force from 1964 until 1969, when he was hired by McDonnell Douglas Aerospace as a manufacturing systems analyst. He owned and managed a general aviation operation from January 1971 until September 1973, when he entered the Air Force reserves as a full-time maintenance manager. The PMI remained as an Air Force reserve maintenance manager until August 1989, when he was hired by the FAA.

1.6 Aircraft Information

N922VV, a DC-9-32, serial number (SN) 47274, was registered to ValuJet Airlines, Inc. The airplane had been purchased from Douglas and was put into service as part of ValuJet's fleet on August 1, 1995. It had previously been operated by Delta Air Lines and Aero Mexico. The airplane was powered by two Pratt & Whitney (P&W) JT8D-9A turbofan engines.

No pertinent discrepancies were noted in the airplane maintenance logs, the minimum equipment list (MEL), or configuration deviations list (CDL). The APU generator malfunction that delayed the aircraft on the first leg of the trip was repaired by maintenance personnel in Atlanta, and the flightcrew noted no further anomaly. No irregularities were noted by the ground or flightcrew before flight 558's departure from Atlanta.

At the time of the accident, flight 558 had an estimated operating weight of 96,489 pounds. The certificated maximum landing weight of this DC-9 was 99,000 pounds. The center of gravity was at 20 percent mean aerodynamic chord, which was within limits.

1.6.1 Landing Gear System

The DC-9 tricycle landing gear is controlled by a lever on the left side of the first officer's instrument panel and is hydraulically actuated by pressure from the right hydraulic system. The main and nose landing gear consist of dual wheels mounted on shock struts, with dual brakes mounted on the main landing gear.

The ground shift mechanism, which is actuated by nosegear shock strut extension/compression, controls whether certain aircraft systems operate in the ground or flight mode.[21] When the nosegear shock strut is compressed by the weight of the aircraft, the ground shift mechanism causes those aircraft systems to be operated in the ground mode. When the nosegear shock strut is extended after takeoff, it triggers the ground shift mechanism,

[21] Refer to figure 2.

electronically shifting the aircraft systems to the flight mode.[22] In addition, when the aircraft is in the flight mode, the ground shift mechanism mechanically centers the nose wheel, locks out the rudder pedal nose wheel steering function, and releases the gear lever anti-retraction mechanism.

According to Douglas representatives, when the nosegear shock strut is underserviced/underinflated, strut extension after liftoff may not be sufficient to activate the ground shift mechanism to shift the aircraft systems into the flight mode and release the gear lever anti-retraction mechanism. Douglas representatives indicated that this is a commonly reported occurrence during cold weather operations. They stated that Douglas had issued numerous service bulletins (SBs) and all operator letters (AOLs) describing the anomaly and recommending maintenance procedures to avoid underserviced/underinflated nosegear shock struts during cold weather operations.[23]

The landing gear lever has DOWN, UPLATCH CHECK,[24] and UP positions. When the airplane is on the ground, the gear lever is locked in the DOWN position by the anti-retraction mechanism. The anti-retraction mechanism can be overridden by use of the landing gear lever release push-button, which is located on the left side of the first officer's instrument panel, beneath the landing gear lever. According to the ValuJet AOM, page 11-2-3, the landing gear lever release button bypasses the landing gear anti-retraction release mechanism if the ground shift mechanism malfunctions, allowing the landing gear lever to be moved to the UP position.

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[22] According to Douglas, the ground sensing control mechanism provides the mechanical means of establishing a ground or flight mode of operation for the aircraft. The ground sensing control mechanism consists of a linkage and a two-way closed circuit cable run that is actuated solely by the nosegear torque links during strut extension or compression. The landing gear lever anti-retraction mechanism is also actuated through the ground sensing control mechanism. The Douglas FCOM indicates that being unable to raise the landing gear handle after liftoff is an indication of a failure in the mechanical portion of the ground shift mechanism, while lack of cabin pressurization is an indication of a failure in the electrical portion of the ground shift mechanism.

[23] Douglas representatives reported that when they become aware that an operator has purchased a Douglas aircraft, the operator is placed on a mailing list and automatically receives all future Douglas communications, SBs, AOLs, etc., for that aircraft. Douglas records indicate that ValuJet has been on the DC-9 mailing list since before it began operations in October 1993. Additionally, Douglas records indicate that on December 16, 1993, ValuJet purchased all back-issued DC-9 aircraft-related Douglas communications, SBs, AOLs, etc., from Douglas. Douglas records also indicate that on February 7, 1994, ValuJet purchased the complete Douglas DC-9 maintenance manual and the temporary repair manual with revisions on microfilm.

[24] According to the ValuJet AOM, when the landing gear lever is moved to the UPLATCH CHECK position, "hydraulic pressure is bypassed in all gear and door hydraulic components. The main gear rests on the [landing gear] doors and the nose gear is held up by the overcenter linkage."

According to the Douglas DC-9 FCOM, section 2, page 4, under the heading "LANDING GEAR -- ABNORMAL OPERATION,"[25] if the pilots are unable to raise the landing gear control handle after takeoff, they should do the following:

> 1. Check nosewheel steering with NORMAL[26] force on wheel.
>
> 2. If wheel does not turn … a malfunction of the gear anti-retract mechanism is indicated. In this event push the gear handle release button and raise the landing gear handle. Go to step 4.
>
> 3. DO NOT RETRACT landing gear if wheel is steerable as there is no assurance that the nosewheel will center, and remain centered, during retraction. Limit speed to applicable gear extend limitations. Continue procedure.
>
> 4. If electrical circuits (auto pressurization, takeoff warning after flaps up) indicate that ground shift is in ground mode, pull ground control relay circuit breakers to place circuits in flight mode. Insure that airplane is depressurized prior to landing.
>
> 5. On next landing, during rollout (above approximately 30 kts.) momentarily release brakes and place the anti-skid switch to OFF and operate brakes manually.
>
> 6. Reset ground control relay circuit breakers during taxi and verify that electrical circuits (auto pressurization, air conditioning, ground blowers) are in the ground mode.

1.6.2 Ground Spoiler System

The DC-9-32 has four spoiler panels located on the upper surfaces of the wings, forward of the trailing edge flaps. During airborne operations, the spoiler panels work with the ailerons automatically, through an aileron/flight spoiler mixer assembly, to help lower the up-aileron wing. Additionally, when the speed brake/ground spoiler control lever is pulled aft during flight, the four spoiler panels extend to function as speed brakes. Maximum spoiler deployment in flight is approximately 30^{o}. During ground operation, the four spoiler panels can be extended to 60^{o} to perform the ground spoiler function. Ground spoiler actuation can be accomplished automatically or manually.

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[25] Excerpts from the Douglas maintenance manuals and FCOM are included in appendix E.

[26] According to Douglas, "NORMAL" force is considered to be equivalent to the force a pilot would apply to the nosewheel steering wheel to steer the aircraft during ground operations.

According to the Douglas DC-9 FCOM, automatic ground spoiler extension requires main wheel spin-up or the ground shift mechanism to be in the ground mode. According to Douglas publications, the flightcrew's action of arming the spoilers for landing, per the normal "Before Landing" checklist, was an acceptable technique, provided that the ground control relay circuit breakers were not reset until after landing. Under these circumstances, with or without the ground control relay circuit breakers reset, the main wheel spin-up during the landing would actuate automatic spoiler extension. Douglas representatives stated that another acceptable option would have been for the pilots not to arm the spoilers before landing and then to manually extend the spoiler panels using the speed brake/ground spoiler control lever during the landing roll. However, the Douglas representatives cautioned that had the pilots chosen this technique, the landing roll would have required more runway than if they had extended the spoilers automatically.

1.6.3 Pressurization System

According to the ValuJet AOM, the DC-9 pressurization system uses bleed air from the engine compressor sections to pressurize and air condition the airplane. The desired pressurization level is maintained by regulating the escape of cabin air through the cabin outflow valves. Although manual outflow valve control may be selected, the cabin outflow valves are normally automatically controlled through the cabin pressure control system. The ValuJet AOM indicates that the automatic cabin pressure controller includes the following controls:

> - A BAR CORR control and IN HG window are used to set appropriate barometric pressure prior to takeoff or descent.
>
> - An ALTITUDE control and an AIRPLANE ALTITUDE window are used to set the controller prior to takeoff and just prior to establishing descent.
>
> - The RATE INC control is used to adjust cabin vertical speed.

Under normal operations, the cabin will begin to pressurize automatically in accordance with the controller limits set by the flightcrew when the nosegear strut extends on takeoff, thereby placing the aircraft systems in the flight mode. Similarly, under normal circumstances, cabin depressurization occurs automatically in accordance with the controller limits set by the flightcrew. Automatic depressurization is normally complete upon landing, when the nosegear strut compresses, and the aircraft systems transition to the ground mode. Page 13-2-2 of the AOM states the following, in part:

> Prior to landing, the ALTITUDE KNOB is used to set the destination airport altitude in the CABIN ALT window to ensure that the cabin altitude will equal airport altitude upon landing.

Additionally, the AOM states the following:

If the airplane lands with the cabin inadvertently pressurized, the automatic system, in response to a signal from the ground control relay, will cause the outflow valves to open and depressurize the aircraft.

In addition to the automatic pressurization system, manual control may be employed. This is done by moving the cabin pressure controller lever down to the manual position (which deenergizes the automatic system) and manually positioning the cabin outflow valves by depressing and rotating the cabin pressure controller wheel.

1.7 Meteorological Information

VMC prevailed when the airplane departed Atlanta and at the time of the accident.

The William B. Hartsfield Atlanta International Airport hourly weather observation at 1456 was the following:

sky—ceiling at 2,800 feet; visibility—10 miles, in light snow; temperature—22 ^{o}F; dew point—14 ^{o}F; and wind—290^{o} at 24 knots.

The Nashville International Airport weather observation at 1626 was the following:

sky—ceiling at 2,400 feet; visibility—5 miles, in light, blowing snow; temperature—21 ^{o}F; dew point—15 ^{o}F; wind—340^{o} at 12 knots, with gusts to 20 knots; and altimeter setting—30.11 inches of mercury. The weather was essentially the same as the preceding and subsequent hourly weather observations, although visibility varied with precipitation intensity throughout the afternoon.

1.8 Aids to Navigation

There were no known difficulties with external aids to navigation.

1.9 Communications

The pilots indicated that all communication and navigation radios functioned normally during ground operations at Atlanta and during the flight from Atlanta to Nashville. There were no known communication difficulties involving the accident airplane before the initial ground impact. After the airplane came to a stop on runway 31, internal communications functioned properly, as the pilots were able to make a PA announcement.

The two communication radio control panels are located on the cockpit control pedestal between the pilots. The communication radio control panels contain the radio frequency selection knobs and the radio on/off switches. Two of the three audio control panels in the

cockpit are also located on the cockpit control pedestal between the pilots. The third audio control panel is located on the overhead panel for the observer's position. The audio control panels permit the pilots to monitor the audio output of the service interphone, communication, and/or navigation radios, and to select the desired communication radio for transmission.

As the pilots performed the go-around, they noted that the No. 2 communication and navigation radios, and the No. 1 communication radio on board the airplane were unusable. Postaccident examination of the aircraft revealed that the No. 1 communication radio on/off switch was positioned in an intermediate (unpowered) position. Additionally, the right DC bus reverse current relay, which provides power to the No. 2 communication and navigation radios, was "open." Postaccident functional testing revealed that the No. 1 and No. 2 communication and navigation radios were capable of normal operation.[27]

The pilots set the airplane's transponder to 7700/7600 in accordance with lost radio communication procedures, and returned to land on runway 31. ValuJet's manuals did not contain specific procedural guidance pertaining to lost radio communications. Nashville ATC made several attempts to advise the flightcrew of the separated nosegear assembly, using tower frequencies and the emergency broadcast frequency, without success. The flightcrew reported that they were not aware of the extent of damage to the airplane; specifically, they stated that they did not know that the nosegear had separated until they heard the scraping noise during the landing roll on runway 31.

1.10 Airport Information

The Nashville International Airport is located approximately 6 miles southeast of Nashville, Tennessee, and has an airport elevation of 599 feet. The airport has four runways, three of which are parallel paved surfaces, oriented north-northeast/south-southwest. The farthest east of these runways, runway 2R, was the assigned landing runway for flight 558. Runway 2R is 8,000 feet long and 150 feet wide. The flightcrew used the fourth runway, runway 31, for landing after the go-around. Runway 31 is 11,029 feet long and 150 feet wide. (Refer to figure 3, "Airport Diagram.")

Nashville International Airport is fully certificated under 14 CFR Part 139. ARFF response was not an issue in this accident.

1.11 Flight Recorders

A digital flight data (FDR) and a cockpit voice (CVR) recorder were installed in the airplane. The FDR was an 11-parameter Loral Fairchild Model F800, SN 6316, recorder. The CVR was a Fairchild Model A-100A, SN 57863. Both recorders were removed from the airplane and sent to the Safety Board's laboratory in Washington, D.C., for readout.

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[27] For additional information on the unusable radios, see section 2.6, "Communications."

The cases of both recorders were intact and exhibited no evidence of damage or excessive wear. Aside from loss of FDR data coincident with the airplane's hard touchdown, good quality recordings were obtained from both recorders.[28]

1.11.1 CVR

The CVR recording consisted of four channels: the cockpit area microphone (CAM), the captain's position, the first officer's position, and the passenger cabin's PA system. The CAM channel, from which all crewmember conversation was transcribed, was of good quality. A transcript was prepared of the entire 30-minute, 26-second recording, which started after the initial ground impact on runway 2R and approximately 2:03 minutes before the aircraft touched down on runway 31. The transcript ended after the APU was shut down, approximately 28 minutes after the aircraft landed on runway 31. The CVR transcript is contained in appendix B.

It should be noted that CVR data are recorded on a 30-minute closed loop tape that records continuously while electrical power is on the airplane and there is power to the CVR. The electrical power on the accident airplane was shut off approximately 36 minutes after the hard landing, and the CVR recording did not include documentation of the hard landing event. About 4 minutes of postimpact/go-around information and all preimpact audio information and conversation had been recorded over and was unrecoverable.

1.11.2 FDR

The FDR experienced data loss coincident with the highest recorded vertical acceleration forces (Gs), which occurred during the hard touchdown of the airplane. The Safety Board's laboratory retrieved portions of the lost data and developed a composite data set of the accident landing.

The readout revealed that the airplane's sink rate was between 39 and 47 feet per second just before runway impact, whereas over the previous 10 seconds, the descent rates were between 0 and 23 feet per second. About 4 seconds before impact, pitch attitude values increased from about 0 to a maximum value of 22.8° nose up about the time of impact. Roll attitude values did not exceed +/-5° throughout the initial impact sequence. During the 2 seconds before impact, vertical acceleration values increased from 0.677 Gs to the final valid recorded value of 2.854 Gs.

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[28] The Safety Board generally uses the following criteria to assess the quality of a CVR recording: a "poor" recording is one in which a transcription is nearly impossible given that a large portion of the recording is unintelligible; a "fair" recording is one in which a transcription is possible, but the recording is difficult to understand; a "good" recording is one in which few words are unintelligible; and an "excellent" recording is very clear and easily transcribed.

Engine pressure ratio (EPR) values remained stable throughout the approximate 15 seconds before touchdown, at 1.39 to 1.41 for the No. 1 engine, and 1.40 to 1.45 for the No. 2 engine, respectively. After the touchdown, EPR values increased to 1.49 and 1.45, decreased to 1.19 and 1.30 for the next second, and then increased over the next 5 seconds to about 2.20 and 2.13 for the Nos. 1 and 2 engines, respectively.

A plot of ValuJet flight 558's FDR data is included as appendix C.

1.12 Wreckage and Impact Information

Debris from the nose landing gear and the runway approach lights was found at the approach end of runway 2R. The first indications of impact were ground scars in the runway approach light area, about 90 feet before the runway threshold lights. Two runway threshold lights and two runway approach lights were damaged.

The airplane came to a stop on runway 31, approximately 10 feet left of the centerline and about 5,800 feet from the approach end of the runway. Runway 31 exhibited scrape marks along the runway centerline. The scrape marks started on the runway centerline, approximately 2,750 feet from the approach end of the runway. The scrape marks continued, veering slightly left of the centerline, for more than 3,000 feet. The scrape marks stopped where the airplane's nosegear strut rested on the pavement. (See section 1.16.1 for details of the landing gear system examination.)

1.13 Medical and Pathological Information

The CVR transcript and pilot statements indicate that during the minutes after the airplane came to a stop on the runway, the flight attendant who occupied the rear cabin jumpseat told the flightcrew that her ribs were sore. Additionally, ValuJet representatives indicate that four passengers reported "minor strains" as a result of this accident. No other injuries were reported.

In accordance with ValuJet's FAA-approved program, the flightcrew provided postaccident toxicological samples for analysis. The samples were analyzed and found to be negative for ethanol and other drugs of abuse. Toxicological samples were not requested or received from the flight attendants.

1.14 Fire

No fire was associated with this accident.

1.15 Survival Aspects

Occupant survivability was not an issue in this accident.

1.16 Tests and Research

1.16.1 Landing Gear System Examination

On January 12, 1996, investigators performed a functional landing gear retraction test and further examination of the landing gear system on the accident airplane. The DC-9 had been relocated to a heated hangar at Nashville International Airport. Investigators were unable to place the airplane on jacks to perform a full landing gear retraction test because damage to the empennage area rendered the rear jack point unusable.

The forward jack point appeared to be safe for use, so the forward portion of the DC-9 was jacked, and a partial landing gear retraction was performed. This operational test of the landing gear system did not reveal a ground shift mechanism anomaly. The ground shift mechanism operated normally, and the nosegear retracted normally during several operational cycles.

Investigators attempted to simulate the accident approach/landing sequence in the hangar by pulling the H20 and J20 circuit breakers to put the airplane in the flight mode. Investigators then performed the "Before Landing" checklist, which included extending the landing gear and arming the spoilers. When they reset the H20 circuit breaker, they observed that the cabin pressurization went to the open position. When the J20 circuit breaker was reset, the ground spoilers deployed.

1.17 Company/Operations Information

1.17.1 ValuJet's Cold Weather/Winter Nosegear Strut Servicing Procedures

The ValuJet COM and maintenance manual contain FAA-approved sections on winter operations. The COM winter operations section was approved by ValuJet's POI on November 17, 1995. On page 5-10 of the winter operations section, under the heading "MAIN AND NOSE GEAR STRUTS" the manual states the following:

> Due to temperature differences during Winter months, a height change in oleo shocks is experienced. To eliminate unnecessary raising and lowering of struts, which contributes to packing damage and leakage, all struts will be checked in accordance with current instructions for proper heights.[29] Unless an aircraft arrives at a station with a flat strut, no pressure should be added. It is better for a strut to be low in a cold climate than excessively high in a warm one.

According to Douglas representatives, several DC-9 operators with aircraft based in cold climates reported that landing gear anomalies from insufficient air charge in the nosegear

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[29] The instructions for proper strut inflation heights are outlined for pilots and maintenance personnel in the ValuJet AOM and maintenance manuals, respectively.

shock strut were more frequent during cold weather operations. The Douglas representatives reported that as a result of these occurrences, most DC-9 operators amended their maintenance practices for cold weather operations, specifically regarding strut inflation and inspection. Those airlines typically amended their cold weather servicing procedures to reflect the procedures recommended in the DC-9 maintenance manual. These procedures are as follows:

A. Nose Gear Strut

(1) prior to cold weather season:

(a) Change fluid in strut. This prevents seal damage caused by water in fluid which changes to ice particles during cold weather exposure.

(b) Replace seals as required.

(2) During cold season:

(a) Check strut for servicing requirements every 14 days.

(b) Wipe exposed chromed surface of piston with MIL-H-5606 hydraulic oil daily.

Investigators reviewed the FAA-approved ValuJet winter operations section of the maintenance manual in effect at the time of this accident and the winter operations section of the revised maintenance manual (dated May 6, 1996). Neither document contained nosegear shock strut servicing procedures that reflected the guidance provided by Douglas.[30]

1.17.2 ValuJet's Manuals

The ValuJet QRH, AOM, and COM are required by Federal Aviation Regulations (FARs) and ValuJet policy to be available to the flightcrew for reference on every flight. Excerpts from the QRH, AOM, and COM, in addition to those presented below, are contained in appendix E.

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[30] According to ValuJet's winter operations manual, "This publication is in effect whenever required by cold weather and its contents are 'Standard Operating Procedures'. Preparation for cold weather will begin September 1st in order to assure material and support equipment is in place when needed. Susceptibility normally begins to decrease after April 15th." Further, the manual states "This reference applies only to those stations where ValuJet has instituted contracts for deicing of its aircraft and will eliminate those cities in the most southern portion of the ValuJet route system where a specific winter procedure is not normally an operational concern."

1.17.2.1 ValuJet's QRH and AOM

ValuJet's QRH, which was consulted by the flightcrew, was stamped "FAA-approved,"[31] with the POI's name, and dated September 14, 1995. The QRH contains condensed guidance for abnormal and emergency procedures.

The instructions in the QRH, on page A-38, under the heading "UNABLE TO RAISE GEAR LEVER," subheading "Approach and landing," state the following:

AIRPLANE.....DEPRESSURIZE (PNF)

ANTI-SKID SWITCH (before 30 kts).....OFF (PNF)

GROUND CONTROL RELAY C/Bs (if pulled)
(H20 and J20).....RESET (C or FO)

The ValuJet AOM is a two-volume manual that describes the systems and procedures for the DC-9. Volume 1 contains procedures for normal, emergency, and abnormal operations; operating limitations; bulletins; flight training; and performance standards/charts. Volume 2 contains systems descriptions for the DC-9. According to the POI, the AOM is an "FAA-approved" document.

The instructions listed on pages A-11-2 and A-11-3 of the AOM, under "UNABLE TO RAISE GEAR LEVER," "Approach and landing," state the following:

AIRPLANE.....DEPRESSURIZE (PNF)
-- Ensure airplane is depressurized prior to landing.

ANTI-SKID SWITCH (before 30 kts).....OFF (PNF)
-- During landing rollout and before 30 kts, momentarily release brakes and place Anti-skid switch to OFF.

GROUND CONTROL RELAY C/Bs (if pulled)
(H20 and J20).....RESET (C or FO)
-- Reset Ground Control Relay circuit breakers during taxi and verify that circuits are in the ground mode.

[31] According to the POI, the term "FAA-approved" applied to a document indicates that the FAA has reviewed the document thoroughly and endorses its contents. The term "FAA-accepted" applied to a document indicates that the FAA has seen the document and "allows" its use. According to the FAA, the term "FAA-accepted" does not imply that a thorough review has been accomplished or that the FAA endorses the contents of the document.

The pilots reported that they referred only to the QRH for abnormal procedural guidance during the flight from Atlanta to Nashville, although the AOM and COM were also available in the cockpit. The pilots reported that during all simulator training, during initial operating experience (IOE), and in normal flight operations, ValuJet encouraged them to use the QRH as their primary source of information for abnormal and emergency procedures. According to both pilots, although they referred to the AOM during the classroom portion of their initial training,[32] when they transitioned to the simulator portion of the initial training, the only reference material available to them was the QRH. The first officer stated that when he and his classmates questioned the absence of the AOM, the Flight Safety International (FSI) simulator instructors informed them that ValuJet wanted them to use the QRH "like a Bible" for abnormal procedures. The first officer indicated that he and his classmates stopped their first simulator session and called the company to get an official determination as to what guidance they should use for abnormal and emergency procedures during routine flight operations; he stated that ValuJet management advised them to use the QRH instead of the AOM.

ValuJet's chief pilot stated that flightcrews are encouraged to use the QRH as a handy initial reference manual in the event of an abnormal occurrence but that they are instructed to then refer to the ValuJet AOM for detailed guidance. On January 8, 1996, the day after the accident, ValuJet's director of flight standards and training issued a letter to all ValuJet pilots, stating the following:

> If it becomes necessary to refer to the QRH (Quick Reference Handbook), for Emergency or Abnormal procedures, please use the appropriate section of the AOM (Aircraft Operating Manual) in conjunction with the QRH.

On February 22, 1996, ValuJet's director of flight standards and training issued a letter to all ValuJet pilots, with reference to first officer approach minimums and QRH removal from aircraft. According to ValuJet's chief pilot, the letter was intended to notify the pilots that the company was raising the first officer approach minimums, removing the QRHs from their aircraft, and replacing the QRH with a laminated emergency checklist to be used with the AOM. It stated the following:

> Effective immediately, First Officer minimums will be 300' AGL and 3/4 miles visibility. Additionally, the First Officer minimums in the first 100 hours will be 500' and 1½ miles visibility.
>
> In the next few days, all of the aircraft should have the new Emergency Check list on board. If you should encounter an aircraft with the QRH on board, please…let us know. In this case, remember that the QRH is to be used for reference only and the Aircraft Operating Manual will have updated

[32] Information on ValuJet's training program is included in section 1.17.3.

> information. Maintenance in ATL and IAD [have the] Emergency Check List on hand.

1.17.2.2 ValuJet's COM

The ValuJet COM is maintained in one binder and contains flight operations bulletins; information on system operations control, line operations, communication, non-scheduled operations, and reports; aircraft logbook and maintenance procedures; emergency procedures; weight and balance; and international operations. The COM also contains a portion of the FAA-approved ValuJet operations specifications and winter operations specifications. According to the POI, the COM is largely an "FAA-accepted" document; however, the operations specifications and winter operations sections within the COM are "FAA-approved."

According to ValuJet, the company expects flightcrews to adhere to the guidance contained within the company manuals, unless adherence to such guidance would result in the flightcrew violating the FARs. Page 1-2 of the COM states the following, in part:

> The Company Operations Manual is a requirement of Federal Aviation Regulation 121. Its purpose is to provide guidance to ValuJet personnel in conducting company operations. The Company Operations Manual contains only part of the rules and procedures that ValuJet and its employees are **required** [emphasis added] to follow. Although this Manual does expand and clarify many requirements of FAR Part 121 and various other regulations, it does not, and is not intended to, substitute for the requirements of the FARs or the contents of the Airman's Information Manual. (Should a disagreement arise between the FARs and the Company Operations Manual, the FARs will always take precedence.)

Additionally, page 1-24 of the COM, under the heading "Duties and Responsibilities," subheading "Captain," states the following, in part:

> [The captain shall] Operate his/her aircraft in accordance with all company directed practices and procedures as well as all applicable rules and regulations except when, in his/her judgment, it is necessary to deviate from such procedures to assure continued safety of flight.

Page 3-17 of the COM, under "CREW MEMBER RESPONSIBILITIES," with regard to the first officer flying, states the following:

> A captain who has at least 100 hours as P.I.C. [pilot-in-command] in jet transport aircraft under Part 121 may, at his/her discretion, allow the First Officer to manipulate the flight controls for takeoffs, approaches and landings as well as en route phases of flight.

The captain, who had 26 hours as a DC-9 captain, told investigators that he was unaware of the 100-hour limitation listed in the COM. Neither the POI nor ValuJet's chief pilot expressed surprise at the fact that the flightcrew failed to abide by COM guidance. In independent postaccident interviews, both the POI and the chief pilot explained the pilots' variance from the COM's 100-hour limitation by citing industry standard operating procedures, and the pilot's right to deviate from rules for safety reasons. The POI further stated that the COM is an FAA-accepted, not FAA-approved, manual.

1.17.2.2.1 In-flight Irregularity Procedures

Page 10-2 of the ValuJet COM, revision 46, under the heading "Reporting," states the following, in part:

> The Captain **shall** [emphasis added] report all incidents and/or irregularities to System Operations by radio or telephone at the earliest opportunity.

On page 10-3, the ValuJet COM further stipulates what pilots should do:

> Provide System Operations Control with information concerning the nature and extent of the malfunction, and its anticipated effect on the management of the flight.

On page 10-4, the ValuJet COM indicates what dispatcher actions will occur in response to a reported irregularity:

> Systems Operations Control will immediately convene the technical specialists (maintenance, flight, etc.) who may be of assistance and will relay to the pilot by radio the recommendations and questions of the technical group. He/She will then direct activities on the ground to support the course of action to be undertaken by the pilot.

The ValuJet COM also states that detailed procedures for handling most mechanical problems are found in the AOM.

1.17.3 ValuJet's Training Program

FSI provides training to ValuJet pilots in accordance with a syllabus provided by ValuJet, based on the FAA-approved ValuJet flight operations training manual. Initial pilot training for ValuJet "new hires" is conducted by FSI at its Airline Learning Center in Miami, Florida. Subsequent training (e.g., upgrade, recurrent, and CRM) is conducted by FSI at its Airline Learning Centers in Miami and Atlanta.

After the accident, both pilots told investigators that they believed that the training they received from FSI was deficient, especially in the area of systems. The first officer's training records indicate that he underwent six simulator training sessions before he took the DC-9 type-rating check ride. The first officer stated that although he successfully completed the type-rating check ride, he did not believe that six simulator sessions were sufficient to provide him with a thorough knowledge or understanding of the systems. The captain's training records indicate that he underwent 10 simulator training sessions before he took the DC-9 type-rating check ride. According to FSI personnel, the number of simulator sessions is variable and is dependent on pilot performance and material coverage.

According to the ValuJet/FSI initial equipment training syllabus,[33] the training program included 13 days of classroom training, 3 days of system integration training in fixed-base simulators, and 6 days of flight training in full-flight simulators. According to the DC-9 initial equipment training syllabus, the classroom modules that addressed the landing gear and pressurization systems were scheduled for 1½ hours and 3 hours, respectively, and were to be augmented in system integration and flight training sessions. The lesson plan for the landing gear module listed the following lesson elements:

1. General description **[34]
2. Nosewheel steering **
3. Ground shift mechanism
    a. Location and purpose
    b. Functions
        1) Left ground control switch
        2) Right ground control switch
    c. Ramifications of override
4. Operating limitations **
5. Controls and indicators **
6. Normal procedures **
7. Emergency/Abnormal procedures
    a. In-depth coverage of all landing gear-related emergency/abnormal procedures

Both pilots reported that although they received instruction in "Unable to Raise Gear Lever" procedures during their initial DC-9 systems simulator training, they did not continue the procedure beyond landing gear retraction. Neither pilot recalled receiving any specific instruction about when to reset the ground control relay circuit breakers.

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[33] Excerpts from the FSI training syllabus are included in appendix E.

[34] Items marked with ** have not been entirely described in the text. The entire lesson plan for the landing gear module is included in appendix E.

According to ValuJet's chief pilot, FSI has been very responsive to changes and improvements to the ValuJet training syllabus. FSI and ValuJet personnel reported that since this accident, the classroom and simulator training regarding "Unable to Raise Gear Lever" procedures have been enhanced.

1.17.3.1 CRM Training

ValuJet initiated a CRM program in January 1995.[35] Pilots who received their initial training after September 1995 received CRM training with the initial training at the FSI facility in Miami. Pilots who received their initial training before September 1995 received the 2-day course in CRM at the FSI facility in Atlanta. The first officer of flight 558 received CRM training with his initial training at FSI in October 1995. Records indicate that the captain of flight 558 completed the CRM training on April 14, 1995, 8 months before his upgrade to captain.

According to the POI, ValuJet's current CRM curriculum does not include integrated (flightcrew, cabin crew, company, etc.) CRM training or a line operational simulation (LOS)[36] program nor is such training required by FARs.

1.17.4 ValuJet's Crew Pay Schedule/Criteria

Records indicate that when ValuJet began operations in October 1993, the company implemented a pay and bonus schedule in which pilots were paid based upon the number of flight segments flown and received bonus pay at the end of the year based on a share of the annual company profits. According to the POI, the airline's pay and bonus schedule has been controversial since the airline became operational. The POI stated that under the ValuJet pay schedule in place at the time of the accident, he did not believe that the pilots would have been compensated for the accident leg of the flight if they had returned to Atlanta rather than completing the trip to Nashville. However, according to ValuJet's director of operations and ValuJet's chief pilot, the pilots would have received "segment 2"[37] pay for the accident leg of the trip sequence, whether they returned to Atlanta or continued the flight to Nashville. On page 1-30 of the COM, revision No. 41, under the heading "Compensation," it states the following:

Flight Operations compensation is based on a segment rate.

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[35] CRM training was not a required portion of air carrier training programs when ValuJet began its operation in October 1993. Subsequently, FARs have required Part 121 and 135 air carrier and commercial operators to provide CRM training for their flightcrews. The CRM training programs must be incorporated into company training by mid-1997.

[36] LOS is the FAA's revised terminology for the training that was formerly known as line oriented flight training (LOFT) and includes special purpose orientation training and line operational evaluation. The revised definition (FAR Part 142.3) was adopted May 23, 1996, and became effective August 1, 1996.

[37] See excerpt from COM, page 1-30, dated March 15, 1995, under the heading "Compensation," in appendix E.

Segments will be numbered according to statute mileage length.
*City to City mileages used are those published by the Department of Transportation, Statute miles, Airport to Airport, Great Circle Route.

Page 1-30 also contains a city to city mileage table for ValuJet's route structure.[38] The table indicates that city to city distances of less than 350 statute miles fall under the segment 2 pay category. According to ValuJet's chief pilot, where only one airport identifier is named under a segment, the mileage listed is from Atlanta to that airport/city. Nashville International Airport is listed under segment 2. Page 1-30, revision No. 41, dated March 15, 1995, was current at the time of the accident.

The pilots stated that they were not certain whether they would have been compensated if they had returned to Atlanta, but they indicated that pay was not a factor in their decisionmaking process. According to the first officer, he had experienced pay discrepancies on some occasions since he was hired by ValuJet and had successfully negotiated with the company to receive back pay.

1.18 Additional Information

1.18.1 FAA Oversight

The POI for ValuJet was involved in ValuJet's certification even before the airline began operation in October 1993. He was directly involved in FAA approval and acceptance of ValuJet's original certification manuals and documents, such as the QRH, AOM, and COM, including the COM's winter operations section. The most current revision to the COM winter operations section at the time of the accident was approved by the POI on November 17, 1995. Although at the time of the accident he met all FAA qualification and currency requirements for POI responsibilities,[39] he did not meet the FAA's currency requirements for the DC-9 when he originally received the ValuJet assignment. Because of this lack of qualification, he referred all DC-9 system-specific documents and manuals to an FAA inspector who was DC-9 qualified and current. According to the POI, the other FAA inspector reviewed the original ValuJet QRH before the POI approved and endorsed it. The applicable FAA Form 8000-36[40] indicated that the ValuJet QRH was approved by the other FAA inspector on October 8, 1993. The FAA form also indicated that the activity took only 1 hour of the FAA inspector's time. Records indicate that subsequent revisions to the QRH were personally reviewed and approved by the POI.

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[38] See appendix E for excerpts from the COM.

[39] The FAA requires that its POIs be qualified in, and remain current in, at least one of the aircraft types operated by the operators they oversee. ValuJet operates only Douglas DC-9 aircraft. The POI stated that it was common to have a more current inspector review an item for approval and that this practice was in accordance with FAA policy.

[40] A copy of the applicable FAA Form 8000-36 is included in appendix F.

The PMI for ValuJet was assigned to his position in December 1994; another FAA inspector held PMI responsibilities during ValuJet's original certification and during the airline's first year of operation. ValuJet's original PMI approved the maintenance manual winter operations section. The PMI at the time of the accident had no experience or familiarity with the DC-9 aircraft or its systems when he received the responsibility for ValuJet's certificate; however, experience in the equipment used by the airline is not an FAA requirement for the PMI position. The PMI met all FAA qualification requirements for PMI responsibilities when he received the ValuJet assignment.

During postaccident interviews, the PMI told Safety Board investigators that he was unaware of the DC-9's history of problems with underserviced/underinflated nosegear shock struts causing landing gear and ground shift mechanism anomalies during cold weather. He further stated that he was unfamiliar with the procedures recommended by Douglas for cold weather operations and did not have any discussions with ValuJet personnel regarding the implementation of any cold weather operations procedures. The PMI left the ValuJet certificate and transferred to the FAA's Southern Regional Office in late August 1996.

1.18.2 Postaccident FAA/ValuJet Actions

Records indicate that on February 5, 1996, the POI sent a letter to ValuJet's senior vice president of operations,[41] expressing his concern about recent accidents and incidents[42] involving ValuJet flights. The POI wrote that the recent incidents involved flightcrews who were either new to the air carrier and/or had very little Part 121 experience, and several involved bad weather. He reported that during his observation of a recent initial training class at FSI in Miami, he noted that only one pilot in the class had prior Part 121 experience. The POI indicated that FAA inspectors conducting en route surveillance had found it necessary to counsel captains during flights to keep them from operating contrary to FARs. The letter continued:

> Recent Enroute Surveillance has indicated that due to the rapid expansion of ValuJet Airlines many of the new Captains have a minimal amount of Part 121 experience. It appears that the Captains are allowing the First Officer to make the takeoff and/or landing out of response to an unwritten practice of alternating that function rather than considering the weather and/or their own need for experience.

On February 14, 1996, a report summary was prepared by the FAA's maintenance aircraft division of the Office of Aviation Flight Standards (AFS-300) as a result of ValuJet's accident and incident history and a Department of Transportation (DOT) Office of Inspector

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[41] Correspondence between the FAA and ValuJet is included in appendix F.

[42] FAA records indicate that from 1994 through September 1996, ValuJet aircraft/flightcrews were involved in three accidents and nine incidents.

General audit of ValuJet.[43] The report addressed ValuJet's accidents and incidents, enforcement history, national aviation safety inspection program (NASIP) inspection results, and the FAA's surveillance activity. The report indicated that ValuJet had a total of 46 violations since 1993, of which 20 remained open at the time the report was written. The report covered approximately 3 years of data and revealed that, "In all areas analyzed, [ValuJet] was at the advisory and or alert threshold...."[44] The report concluded that the data reviewed "...clearly show some weakness..." in the FAA's overall surveillance of ValuJet's operations, with specific weaknesses noted in the following areas:

1. Manuals and Procedures.…
2. Shop and Facilities.…
3. Structural Inspection.…

The report recommended the following actions:

1. Consideration should be given to an immediate FAR-121 re-certification of this airline.…
2. The overall surveillance of the air carrier should be increased in FY96. Special attention should be directed toward manuals and procedures, structural inspections, the adequacy of the maintenance program, and shops and facilities.…
3. The close out dead line for the NASIP inspection is February 28, 1996. Every effort should be made to meet this dead line with positive corrective action.
4. When a violation of the FARs are detected the inspector should consider past enforcement history before administrative corrective action is offered. If an air carrier violates the same regulation in a short period of time, escalating the enforcement action may be appropriate.

On February 16, 1996, the FAA's Atlanta FSDO issued a letter that announced the initiation of a special emphasis program at ValuJet to positively identify areas of concern and the

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[43] This report is included in appendix F.

[44] According to AFS personnel, the terms "advisory" and "alert" are evaluative terms used to describe air carrier noncompliance with (or potential for deviation from) published safety requirements and standards, based on data retrieved from the FAA's Safety Performance Analysis System. "Advisory" and "alert" correspond to mid- and low-level compliance, respectively. The approximate formula for "large Part 121 air carrier groups" is as follows:

A = the average number of reported instances of air carrier noncompliance with (or potential for deviation from) published safety requirements and standards.

1 x A = "advisory"

1.5 x A = "alert"

corrective actions necessary to reduce or eliminate the problem areas. The letter stated the following:

> ValuJet is an unconventional carrier when compared to more traditional 121 operators. They are innovators, dedicated to low overhead, leasing rather than owning, and tightly controlling all expenses. The tight control of expenses includes training (pilot pays), equipment purchases (used), and maintenance (all contracted out to geographically diverse low bidders.)

According to the letter, the program would consist of the following four elements:

- Supplementing the existing FAA employee assignment to ValuJet.
- Special seven day systems (operational observation) review.
- Analysis of data collected in more than 375 inspections of all types, over a period of two years.
- Identify and implement corrective actions.

The 120-day special emphasis program was initiated on February 22, 1996. On February 27, 1996, the POI sent another letter to ValuJet's senior vice president of operations, which stated the following, in part:

> In the two and a half years that ValuJet Airlines, Inc. has been certificated, the Federal Aviation Administration has conducted one (1) RASIP and one (1) NASIP inspection. Additionally, the Department of Defense has conducted two inspections. None of these inspections have produced any Findings that would tend to explain the number of recent accidents and incidents that have occurred.
>
> In an effort to uncover any uncommon denominator that might have been present in each incident, this office launched a Special Emphasis Program on February 22, 1996 in which we stepped up FAA surveillance throughout your route structure. It is still very early in our program and although we are not prepared to announce any trends at this time based on our surveillance, we have become aware of certain factors that were present in many case's that could have had some influence on the Captains judgment.

The POI's letter also expressed concern about ValuJet's pay and bonus policies in effect during the first few years of the airline's operations. He indicated that the FAA was concerned that pay considerations might have influenced the pilots' decisions with regard to the safe operation of their flights. The POI requested that ValuJet review its pay policies and determine to what extent, if at all, the pay policies were affecting the safety of its flights. The POI also requested a copy of the ValuJet pilot compensation program.

On March 15, 1996, the Atlanta FSDO issued a document that indicated that the preliminary results of the special emphasis program revealed discrepancies in maintenance

inspection programs, MEL management, decisionmaking by cockpit crews, aircrew abnormal checklist training, and gate agent training. The document also recognized that many corrective actions had already been implemented by ValuJet, such as the following:

- ValuJet hired an Operations Manager to oversee the Dispatch Office.
- ValuJet implemented an in-house self audit program under the direction of ValuJet's Director of Safety.
- ValuJet initiated a standard practice manual system.

The document noted several actions taken by ValuJet as a result of the special emphasis program. In the operational area, these actions included:

- Signed an updated contract for a Cockpit Resource Management Program to be taught by Flight Safety International. This class was originally to be given only to new hires, but has now been escalated to encompass all pilots. All will have been trained by May 15, 1996.
- They have started holding Captain's Seminars. An 8 hour course that will be given to all upgrading Captains. This will be a retroactive course that will include all current ValuJet Captains. Training of the latter group should be completed by June 1, 1996.
- First Officer Minimums have been raised to 500' agl and 1 mile for the first 250 hours at ValuJet. All current First Officers have been increased to 300' agl and 3/4 miles.
- Restrictions have been implemented requiring Captains to make all landings on
    a. runways of 7,500 feet or less
    b. contaminated runways when braking action is reported as less than good
    c. when ice or slush is on the runway
    d. during heavy rain
    e. when there is any snow accumulation
- Implemented double the FAR requirement for minimum time for crew pairing of new pilots with new Captains.
- Beginning on March 10, 1996, three of Flight Safety International's most experienced check airmen will conduct comprehensive line checks of [ValuJet] pilots and flight operations over a 10 day period.
- Established a monthly Safety Review, to be published by the Check Airmen's Department, covering all incidents involving DC-9's, as well as any related incidents or accidents.
- Established a monthly publication of a Standards letter from the Check Airmen's Department that will include a review of specific procedures and questions about the DC-9.

The document also listed numerous maintenance-related changes implemented by ValuJet as a result of the special emphasis program's preliminary findings.[45]

After the crash of ValuJet flight 592 in the Florida Everglades on May 10, 1996, the FAA increased its surveillance of ValuJet. On June 17, 1996, ValuJet suspended revenue flight operations. On June 18, 1996, ValuJet agreed to surrender its operating certificate to the FAA and signed a consent order with the FAA stipulating that the FAA would retain ValuJet's operating certificate "until such time as the FAA determines that ValuJet is qualified and capable of exercising the privileges of the holder of an Air Carrier Operating Certificate."

On August 29, 1996, the FAA returned ValuJet's air carrier operating certificate, permitting the company to resume operations if the airline is found to be managerially and financially fit by the DOT. According to the FAA, ValuJet had 51 aircraft in operation when it ceased operations in June 1996. On September 30, 1996, ValuJet resumed operations.

[45] ValuJet's actions are listed in full in appendix F.

2. ANALYSIS

2.1 General

The flightcrew was certificated, trained and qualified for the flight, and in compliance with the Federal regulations on flight and duty time. The flight attendants had completed ValuJet's FAA-approved flight attendant training program. The airplane was properly certificated and operated in accordance with applicable Federal regulations. VMC prevailed at the time of the accident; however, cold weather/winter conditions existed at the time of the accident.

During their departure from Atlanta, the pilots experienced difficulty raising the landing gear and had to manually bypass the landing gear anti-retraction system before they could successfully retract the landing gear. As they continued the climb, the pilots realized that although the airplane was airborne, the cabin pressurization and takeoff warning systems were still operating in the ground mode. In accordance with the guidance contained in the QRH, the pilots pulled the ground control relay circuit breakers and observed that the airplane's pressurization and takeoff warning systems began to operate in the flight mode. Because of the irregularities encountered by the pilots, and because postaccident examination and testing of the nosegear and its systems revealed no evidence of preimpact mechanical anomaly, the Safety Board concludes that the nosegear shock strut extension during the initial climbout was insufficient to actuate the ground shift mechanism, release the landing gear lever anti-retraction mechanism, and shift the airplanes systems to the flight mode.

It is likely that the nosegear shock strut did not extend far enough to actuate the ground shift mechanism because it was underserviced/underinflated for the cold/winter weather conditions. The en route portion of the flight proceeded uneventfully. When the airplane was about 100 feet above the ground during the approach to Nashville, the pilots reset the ground control relay circuit breakers, thereby unintentionally shifting the airplane systems from the flight mode to the ground mode. The ground spoilers subsequently extended in flight, and the airplane descended suddenly, impacting the ground in the runway approach light area.

2.2 Cold Weather/Winter Flight Operations

During his preflight inspection of the DC-9, the captain of flight 558 observed that the nosegear shock strut appeared to have normal extension. However, according to Douglas representatives, visual inspection for proper nosegear strut extension by flightcrew members cannot be relied upon to detect underserviced/underinflated nosegear struts. The Safety Board concludes that such preflight visual inspections by flightcrews cannot be relied upon to detect underserviced/underinflated DC-9 nosegear struts and that more frequent and detailed maintenance inspections of the DC-9 nosegear shock strut should be included in cold weather maintenance procedures.

The Safety Board notes that numerous airlines follow specific maintenance procedures for cold weather protection and servicing of the nose landing gear, typically following

the additional cold weather servicing practices recommended in the DC-9 maintenance manual. However, ValuJet's maintenance manual had not been revised or amended in accordance with the manufacturer's recommended cold weather nosegear servicing procedures. Although ValuJet's route structure involved primarily southern locations that do not normally experience severe cold weather, ValuJet does operate its airplanes in areas where they can be exposed to cold weather conditions. The scope and range of jet travel and the unpredictable nature of weather systems are such that no airline operating in the continental United States can safely consider its aircraft exempt from any such weather extremes. The Safety Board concludes that ValuJet Airlines and the FAA should have recognized the possibility of airplanes being exposed to cold weather conditions and the potential nosegear problems from such exposure, and ValuJet should have developed cold weather nosegear servicing procedures similar to those in the DC-9 maintenance manual to address these problems.

Accordingly, the Safety Board believes that ValuJet should develop, immediately, a more extensive and accurate winter operations manual, with corresponding adjustments to maintenance procedures, to reflect the manufacturer's cold weather nosegear servicing procedures. Further, because no airline is exempt from encountering a range of weather extremes, the Safety Board believes that the FAA should require all airlines to review their operations and maintenance manuals and, if necessary, adjust or expand these manuals to reflect the manufacturer's recommended cold weather nosegear servicing procedures.

2.3 Flightcrew Actions/Decisionmaking

The Safety Board is concerned that several times during the accident trip sequence, the flightcrew did not adhere to FAA-accepted ValuJet COM guidance. The Safety Board identified at least three instances during which company procedures clearly were not followed.

The first instance occurred when the first officer flew the second leg and planned to fly the third leg of the trip. Although according to the COM, a captain may allow the first officer to fly the airplane when the captain has at least 100 hours as PIC in jet transport aircraft under Part 121, at the time of the accident, the captain of flight 558 had only 26 hours as PIC. Therefore, the captain was not authorized under the COM to allow the first officer to fly the airplane. The captain told investigators that he was not familiar with the section of the COM that indicated that he was not supposed to share flying duties with the first officer.

The Safety Board notes that the first officer appeared to be competent and capable of pilot flying duties, and the weather, although marginal VMC, was above first officer approach minimums. The Safety Board concludes that although the first officer's performing pilot flying duties did not jeopardize the safety of the flight, the captain's decision to allow the first officer to act as the flying pilot indicates a lack of awareness and/or regard for the guidelines contained within the ValuJet COM.

The second instance during which company procedures were not followed was when the pilots did not notify ValuJet system operations/dispatch that they were unable to raise

the landing gear without pushing the landing gear handle release button. Also, they did not report that they needed to disengage the ground control relay circuit breakers to put the airplane in flight mode.

The Safety Board concludes that had the pilots adhered to COM procedures and notified system operations/dispatch of the landing gear irregularity during their departure from Atlanta, they would probably have received sufficient maintenance advice and guidance from technical specialists to land uneventfully at either Atlanta or Nashville. According to ValuJet's chief pilot, if the pilots had informed system operations/dispatch of the anomaly during their departure from Atlanta, they probably would have been advised to return to Atlanta to have company maintenance personnel examine the airplane. The chief pilot indicated that in their advisory capacity, dispatch and maintenance personnel would have reviewed the appropriate landing procedures with the flightcrew before they returned to land.

Finally, the flightcrew used only the QRH, without referring to the AOM, to determine how to address the anomalies that arose. Page A-38 of the QRH lists resetting the ground control relay circuit breakers under the heading "Approach and landing," and although the preceding checklist item, "ANTI-SKID SWITCH (before 30 kts)," is clearly an after-landing item, the QRH does not include the specific instructions to reset the ground control relay circuit breakers **after landing/during taxi**. Thus, had the pilots consulted the AOM for more detailed guidance, they might have recognized that they should not reset the ground control relay circuit breakers until after the airplane was on the ground, and the accident might not have occurred. However, the Safety Board concludes that there was adequate information available on page A-38 of the QRH for the flight to have landed uneventfully at Nashville.

The pilots indicated that although it was unwritten, they believed that ValuJet management had encouraged them to consider the QRH their primary reference source for abnormal procedures. The use of "unwritten" procedures, combined with a failure to hold personnel accountable for following published guidance, can erode the importance, and concomitantly, the value, of the existing guidance. The Safety Board concludes that the flightcrew's decisions and actions in this case demonstrate insufficient concern for adherence to and a lack of company guidance about the guidelines and procedures set forth in the FAA-accepted ValuJet COM and the FAA-approved ValuJet AOM.

The Safety Board is also concerned that neither the POI nor ValuJet's chief pilot seemed concerned that the flightcrew failed to abide by COM guidance. Therefore, the Safety Board believes that the FAA should stress the importance of adherence to the rules, structure, and guidelines within the revised ValuJet COM to ValuJet management and its employees, to FSI (or other contracted training organizations used by ValuJet), and to the individuals responsible for the oversight of ValuJet.

The flightcrew encountered several airplane system anomalies shortly after departure from Atlanta. Once the airplane was safely airborne and en route from Atlanta to Nashville, the pilots had sufficient time under relatively low stress and access to adequate resources to make informed, thoughtful decisions about how to proceed. Had the pilots felt that

they needed more time and/or information, they could have requested ATC clearance to enter a holding pattern while they consulted additional resources. However, the pilots' statements and actions indicated that they did not perceive a need for additional time or information to decide how to deal with the anomalies.

The Safety Board concludes that although the pilots had sufficient time to assess their circumstances, seek assistance from other resources, review the options available to them, and make a thoughtful decision, the pilots' decisions, procedures, and actions resulted in the inadvertent in-flight activation of the ground spoilers while the airplane was on short final approach for the runway. The Safety Board determines that the flightcrew's improper decisions, procedures, and actions were directly causal to the accident.

2.4 ValuJet's Training Program

The pilots told Safety Board investigators that they believed that the training they received from FSI was deficient, especially in the area of aircraft systems. In fact, although both pilots had recently completed ValuJet/FSI training in the DC-9 and its systems, the pilots demonstrated that they did not have adequate knowledge or understanding of DC-9-32 systems to properly diagnose and respond to the abnormal situation when they reset the ground control relay circuit breakers on short final approach to the runway.

In an attempt to determine whether there were identifiable deficiencies in the ValuJet/FSI training program, Safety Board investigators examined the FAA-approved ValuJet flight operations training manual and the FSI ValuJet DC-9 initial equipment training syllabus. Although the Safety Board did not find any specific discrepancies in the FSI training syllabus, the syllabus was very general and did not go into detailed description of the material to be covered by FSI instructors. One possible consequence of the lack of detailed guidance for FSI instructors to follow is inconsistent application of the existing guidance by FSI instructors. However, as mentioned previously, according to ValuJet and FSI personnel, ValuJet and FSI have since revised and improved the training syllabus in response to perceived deficiencies.

The Safety Board also observes that the training syllabus did not contain written guidance about the ValuJet manuals or other reference materials to be used by FSI instructors in support of the lesson plans. Again, the pilots of flight 558 used the AOM as the sole reference manual during their classroom training and then were told that the QRH should be used instead of the AOM when they transitioned from the classroom to the simulator. The Safety Board notes that the AOM and QRH were never used at the same time in the training environment, which had the unfortunate effect of reducing the opportunity for comparison of the instructions contained in the manuals. Had the manuals been used side by side in classroom training, it might have been clearer to the pilots that the ground control relay circuit breakers should have been reset after landing.

The Safety Board concludes that ValuJet's pilot training, as performed by FSI, conformed with the FAA's requirements. However, the Safety Board concludes that the pilots' actions and statements illustrate that their knowledge or understanding of the aircraft systems and

the effects those systems have on each other was inadequate. Although the Safety Board recognizes and commends ValuJet's efforts to revise and improve the pilot training syllabus used by FSI, the Safety Board believes that the FAA should reevaluate ValuJet's flight operations training manual and the ValuJet training syllabus used by FSI, and require ValuJet to revise or expand these documents to include more detailed descriptions and explanation of the DC-9 systems and procedures.

2.4.1 Crew Resource Management Training

The Safety Board notes that ValuJet initiated a 2-day CRM training course in January 1995 and that both the captain and first officer of flight 558 had completed this training. The Safety Board is concerned that the ValuJet CRM course may have only provided an overview of **cockpit** resource management, without thoroughly teaching the concept of total, integrated **crew resource** management. Pilots who possess an operational awareness of integrated crew resource management practices would likely understand the value of communicating with operations/dispatch and flight attendants, and of accessing the more detailed procedural and systems information available to them in the AOM.

Although the pilots did not brief the flight attendants about the irregularity and its possible ramifications during the go-around, the pilots indicated that the omission was the result of the limited time available to them during the go-around. Records indicate that the pilots had approximately 6 minutes between the hard landing on runway 2R and their touchdown on runway 31. According to the CVR transcript, approximately 15 seconds before the airplane touched down on runway 31, the first officer stated "…[we] should've braced them in the back." The flightcrew's failure to discuss the irregularity and its possible ramifications with the flight attendants is further evidence of insufficient adherence to the accepted principles of crew resource management training.

Although the direct communication and coordination between the captain and first officer were not an issue in this accident, the Safety Board concludes that the pilots' failure to communicate with and utilize some of the other resources available to them (such as the more detailed written procedural guidance located in the AOM, or in-flight maintenance advice through ValuJet system operations/dispatch in Atlanta or from contract maintenance personnel in Nashville) raises questions about the effectiveness of the CRM training provided. Therefore, the Safety Board believes that ValuJet should clarify for all flightcrews the importance of referencing all available crew reference documents and consulting with company maintenance personnel (time permitting) to resolve in-flight abnormalities before committing a flight to landing.

Further, the Safety Board believes that the FAA should require ValuJet to revise its CRM training curriculum to more clearly reflect modern integrated (flightcrew, cabin crew, company, etc.) CRM practices (including LOS training) and to combine academic/classroom training with integrated practical crew simulations.

2.5 ValuJet Pay Schedule

During its investigation, the Safety Board received conflicting information about ValuJet's pay and bonus schedule. The Safety Board questioned whether the pay and bonus schedule in use by ValuJet at the time of this accident (on page 1-30 of ValuJet's COM, dated March 15, 1995) was a factor in the flightcrew's decision to continue the flight to its destination, rather than return to Atlanta after the irregularity. Although the information indicated the basis for ValuJet's pilot pay schedule, the COM did not define ValuJet's application of the pay policy in the event that a scheduled flight did not reach its intended destination.

Also, the Safety Board is concerned that the individuals interviewed about the pay schedule held dissimilar views about how the ValuJet pay schedule would have been applied had the flightcrew elected to return to Atlanta after the irregularity. However, the Safety Board notes that the documentation it reviewed after the January 7, 1996, accident had not been revised or changed since March 15, 1995. The change bar on page 1-30 indicates that the change(s) effected on March 15, 1995, pertained to route structure/city to city mileage. The Safety Board concludes that ValuJet's pay schedule was fairly constant in the months preceding the accident.

The Safety Board notes that ValuJet's pay and bonus schedule has evolved as a result of adjustments to ValuJet's route structure and employee feedback, as well as in response to recent incidents and accidents. According to an August 14, 1996, letter from ValuJet's vice president and project manager to the FAA Atlanta FSDO, the most recent revised ValuJet pay and bonus schedule reflects increased segment pay rates for first- and second-year captains and first officers, with decreased eligibility for, and reliance upon, annual bonus pay. The Safety Board recognizes and supports ValuJet's efforts to provide an improved pay and bonus schedule for its employees.

2.6 Communications

The pilots indicated that all communication and navigation radios functioned normally throughout the flight from Atlanta to Nashville; the first anomaly was noted during the go-around procedure after the airplane touched down hard in the approach light area short of runway 2R. During the go-around, the pilots noted that the No. 1 (captain's) communication radio and the No. 2 (first officer's) communication and navigation radios were unusable.

Postaccident examination of the aircraft revealed that the No. 1 communication radio was unusable because the No. 1 communication radio on/off switch was positioned in an intermediate (unpowered) position. The pilots stated that they did not intentionally place the No. 1 communication radio switch in the intermediate (unpowered) position nor did they recall bumping the No. 1 communication radio switch. However, the Safety Board notes that the No. 1 communication radio switch, which is located on the left (captain's) side of the control pedestal between the two pilots, might have been inadvertently and unknowingly bumped by either flightcrew member during the initial ground impact at Nashville or during their performance of subsequent go-around procedures.

Additionally, postaccident examination revealed that the right DC bus reverse current relay, which provides power to the No. 2 communication and navigation radios, was

"open." The right DC reverse current relay is mounted on the inside of the aft wall of the nose wheel well and is not accessible from the cockpit during flight. The Safety Board notes that during the initial ground impact, the nose landing gear struck the ground with enough force to separate the nosewheel assemblies from the nosegear strut. It is likely that either the force of the initial ground impact or an impact of the nose wheel assembly/debris against portions of the nose wheel well resulted in the "opening" of the right DC reverse current relay.

The Safety Board concludes that there were no preexisting (preimpact) communication/navigation radio anomalies; rather, the radio difficulties that the flightcrew encountered during the go-around were, directly or indirectly, the result of the airplane's impact with the ground in the approach light area short of runway 2R.

2.7 CVR Issues

The investigation of this accident was complicated by the fact that the 30-minute closed loop CVR tape did not include documentation of the initial approach to runway 2R, the hard landing event, or the go-around. Although the flightcrew's statements and recollections were detailed and clear, information pertinent to the investigation was unrecoverable because of the 30-minute tape duration. The Safety Board concludes that had the flightcrew turned off power to the CVR after the airplane was safely stopped on the ground, investigators would have had access to valuable documentation of the hard landing and the events leading up to it. Therefore, the Safety Board believes that the FAA should require all airlines to revise their procedures to stipulate that flightcrews turn off power to the CVR as part of the engine shutdown procedure in the event of a reportable incident/accident.

Over the years, the Safety Board has investigated several accidents and incidents in which pertinent CVR information has been overwritten and lost because of the 30-minute recording limitation. The Safety Board has recognized the advantages of an extended duration CVR in certain accidents and especially in incidents. On March 6, 1995, as a result of the investigation of the Continental Airlines flight 795 accident at LaGuardia Airport on March 2, 1994,[46] the Safety Board issued the following safety recommendation to the FAA:

> Require, after December 31, 1995, that all newly manufactured cockpit voice recorders intended for use on airplanes have a minimum recording duration of 2 hours. (A-95-23)

Because the FAA responded that it would address this issue in upcoming rulemaking, the Safety Board classified this recommendation "Open—Acceptable Response" in May 1996. As a result of a new recommendation being made in this report, Safety Recommendation A-95-23 is now classified "Closed—Unacceptable Action/Superseded."

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[46] For more detailed information, read Aircraft Accident Report—"Runway Overrun Following Rejected Takeoff, Continental Airlines Flight 795, McDonnell Douglas MD-82, N18835, LaGuardia Airport, Flushing, New York, March 2, 1994" (NTSB/AAR-95/01)

The Safety Board further concludes that the 30-minute closed loop CVR tape on board the accident airplane was of inadequate duration to be helpful in the investigation of this accident, because pertinent impact-related audio information and conversation had been recorded over and was unrecoverable. Therefore, the Safety Board believes that the FAA should require that all newly manufactured CVRs intended for use on airplanes have a minimum recording duration of 2 hours.

2.8 ValuJet Actions/FAA Oversight

The Safety Board notes that there was no indication that the POI recognized that the manner in which FSI and ValuJet used the ValuJet manuals and handbooks during pilot training was potentially confusing to the pilots. Although documentation indicates that the POI occasionally sat in on portions of the FSI/ValuJet ground school, there is no evidence that he ever audited the entire training class. Additionally, the POI and the original PMI approved the winter operations portions of ValuJet's COM and maintenance manual, respectively, when neither document included cold weather/winter servicing procedures for the nosegear shock strut. The Safety Board concludes that the FAA's oversight of ValuJet's procedures and operations was inadequate.

The Safety Board notes that according to FAA records, ValuJet made numerous changes in its training, flight operations, pay and bonus schedule, and maintenance practices, with increasing frequency and focus on these issues in the months between this accident and the crash of flight 592. The Safety Board recognizes that the FAA and ValuJet appeared to be trying to identify the problem areas in the airline and make changes to improve safety in ValuJet's operations when flight 592 crashed in the Florida Everglades. The Safety Board will further analyze and make conclusions with regard to ValuJet's actions and the FAA's oversight of ValuJet, and develop recommendations, as needed, in its report on the flight 592 accident.

3. CONCLUSIONS

3.1 Findings

1. The flightcrew was certificated, trained and qualified for the flight, and in compliance with the Federal regulations on flight and duty time.

2. The airplane was properly certificated and operated in accordance with applicable Federal regulations.

3. The nosegear shock strut extension during the initial climbout was insufficient to actuate the ground shift mechanism, shift the airplane systems to the flight mode, and release the gear lever anti-retraction mechanism.

4. Preflight visual inspections by flightcrews cannot be relied upon to detect underserviced/underinflated DC-9 nosegear struts, and more frequent and detailed maintenance inspections of the DC-9 nosegear shock strut should be included in cold weather maintenance procedures.

5. ValuJet Airlines and the Federal Aviation Administration should have recognized the possibility of airplanes being exposed to cold weather conditions and the potential nosegear problems from such exposure, and ValuJet should have developed cold weather nosegear servicing procedures similar to those in the DC-9 maintenance manual to address these problems.

6. Although the first officer's performing pilot flying duties did not jeopardize the safety of the flight, the captain's decision to allow the first officer to act as the flying pilot indicates a lack of awareness and/or regard for the guidelines contained within the ValuJet company operating manual.

7. Had the pilots adhered to ValuJet's company operating manual procedures and notified system operations/dispatch of the landing gear irregularity during their departure from Atlanta, they would probably have received sufficient maintenance advice and guidance from technical specialists to land uneventfully at either Atlanta or Nashville.

8. There was adequate information available on page A-38 of the quick reference handbook for the flight to have landed uneventfully at Nashville

9. The flightcrew's decisions and actions in this case demonstrate insufficient concern for adherence to and a lack of company guidance about the guidelines and procedures set forth in the Federal Aviation Administration (FAA)-accepted ValuJet company operating manual and the FAA-approved ValuJet aircraft operating manual.

10. Although the pilots had sufficient time to assess their circumstances, seek assistance from other resources, review the options available to them, and make a thoughtful decision, the pilots' decisions, procedures, and actions resulted in the inadvertent in-flight activation of the ground spoilers while the airplane was on short final approach for the runway.

11. ValuJet's pilot training, as performed by FSI, conformed with the FAA's requirements.

12. The pilots' actions and statements illustrate that their knowledge and understanding of the aircraft systems and the effects those systems have on each other were inadequate.

13. The pilots' failure to communicate with and utilize some of the other resources available to them (such as the more detailed written procedural guidance located in the aircraft operating manual, or in-flight maintenance advice through ValuJet system operations/dispatch in Atlanta or from contract maintenance personnel in Nashville) raises questions about the effectiveness of the crew resource management training provided.

14. ValuJet's pay schedule was fairly constant in the months preceding the accident.

15. There were no preexisting (preimpact) communication/navigation radio anomalies; rather, the radio difficulties that the flightcrew encountered during the go-around were, directly or indirectly, the result of the airplane's impact with the ground in the approach light area short of runway 2R

16. Had the flightcrew turned off power to the cockpit voice recorder after the airplane was safely stopped on the ground, investigators would have had access to valuable documentation of the hard landing, and the events leading up to it.

17. The 30-minute closed loop cockpit voice recorder tape on board the accident airplane was of inadequate duration to be helpful in the investigation of this accident, because pertinent impact-related audio information and conversation had been recorded over and was unrecoverable.

18. The FAA's oversight of ValuJet's procedures and operations was inadequate.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the flightcrew's improper procedures and actions (failing to contact system operations/dispatch, failing to use all available aircraft and company manuals, and prematurely resetting the ground control relay circuit breakers) in response to an in-flight abnormality, which resulted in the inadvertent in-flight activation of the ground spoilers during the final approach to

landing and the airplane's subsequent increased descent rate and excessively hard ground impact in the runway approach light area.

Contributing factors in the accident were ValuJet's failure to incorporate cold weather nosegear servicing procedures in its operations and maintenance manuals, the incomplete procedural guidance contained in the ValuJet quick reference handbook, and the flightcrew's inadequate knowledge and understanding of the aircraft systems.

4. RECOMMENDATIONS

As a result of the investigation of this accident, the National Transportation Safety Board makes the following recommendations:

--to the Federal Aviation Administration:

Require all airlines to review their operations and maintenance manuals and, if necessary, adjust or expand these manuals to reflect the manufacturer's recommended cold weather nosegear servicing procedures. (A-96-166)

Stress the importance of adherence to the rules, structure, and guidelines within the revised ValuJet company operating manual to ValuJet management and its employees, to Flight Safety International (or other contracted training organizations used by ValuJet), and to the individuals responsible for the oversight of ValuJet. (A-96-167)

Reevaluate ValuJet's flight operations training manual and the ValuJet training syllabus used by Flight Safety International, and require ValuJet to revise or expand these documents to include more detailed descriptions and explanation of the Douglas DC-9 systems and procedures. (A-96-168)

Require ValuJet to revise its crew resource management (CRM) training curriculum to more clearly reflect modern integrated (flightcrew, cabin crew, company, etc.) CRM practices (including line operational simulation training) and to combine academic/classroom training with integrated practical crew simulations. (A-96-169)

Require all airlines to revise their procedures to stipulate that flightcrews turn off power to the cockpit voice recorder as part of the engine shutdown procedure in the event of a reportable incident/accident. (A-96-170)

Require that all newly manufactured cockpit voice recorders intended for use on airplanes have a minimum recording duration of 2 hours. (A-96-171)

--to ValuJet Airlines :

Develop, immediately, a more extensive and accurate winter operations manual, with corresponding adjustments to maintenance procedures, to reflect the manufacturer's cold weather nosegear servicing procedures. (A-96-172)

Clarify for all flightcrews the importance of referencing all available crew reference documents and consulting with company maintenance personnel (time permitting) to resolve in-flight abnormalities before committing a flight to landing. (A-96-173)

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December 11, 1996

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5. APPENDIXES

APPENDIX A - INVESTIGATION AND HEARING

1. Investigation

The National Transportation Safety Board was initially notified of this accident about 1745 on January 7, 1996, by the Federal Aviation Administration's Southern Region Communication Center. One investigator from the Safety Board's Southeast Regional Office was immediately dispatched to the scene, and CVR and FDR specialists assisted in the investigation.

Parties to the investigation were the FAA, ValuJet, and the Douglas Aircraft Company.

2. Public Hearing

No public hearing was held in connection with this accident.

APPENDIX B - COCKPIT VOICE RECORDER TRANSCRIPT

Transcript of a Fairchild A100A cockpit voice recorder (CVR), s/n 57863, installed on a DC9-32, N922VV, which was involved in an accident in Nashville, TN, on January 7, 1996.

LEGEND

CAM	Cockpit area microphone voice or sound source
-1	Voice (or position) identified as Captain
-2	Voice (or position) identified as First Officer
-3	Voice identified as Nashville Airport ground personnel
-4	Voice identified as first Flight Attendant
-5	Voice identified as Nashville Airport ground personnel
-6	Voice identified as passenger
-7	Voice identified as passenger
-8	Voice identified as passenger
-?	Voice unidentified
PA	Aircraft public address system
*****	Unintelligible word
#	Expletive deleted
( )	Questionable text
[ ]	Editorial insertion
-	Break in continuity

On April 26, the first officer made the following comments concerning the transcript:

1) At 1:06, replace "* *" with "flaps".
2) At 1:20, replace "*" with "sorry".
3) At 2:06, replace CAM-? With CAM-2 and "(idle)" with "manual", respectively.
4) At 2:28, replace CAM-? With CAM-2 and "(braking)?" with "is it braking?", respectively.
5) At 3:04, replace CAM-2 with CAM-1
6) At 4:20, replace "* * *" with "before you set down".
7) At 5:00, replace CAM with CAM-2.
8) At 6;23, replace CAM-? With CAM-1.
9) At 17:31, replace "wonder what" with "do you want" and "* *" with "an", respectively.
10) At 18:26, replace "* *" with "ah".
11) At 25:29, replace CAM-? With CAM-2.
12) At 26:50, replace "* * *" with "rolled the".

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0000:00 [start of recording]			
0000:00 [start of transcript]			
0000:02 CAM-2	okay we got three green ... okay three zero, that's three zero over there.		
0000:09 CAM-2	stand by twenty-five flaps.		
0000:12 CAM-2	do not arm the spoilers.		
0000:22 CAM-2	we (could have) blown tires and everything right now.		
0000:25 CAM-2	see it?		
0000:25 CAM-1	yeah.		
0000:26 CAM-2	let's turn right (in) and go in and land.		
0000:30 CAM-2	this is eleven thousand feet.		
		0000:40 RDO-2	nashville tower critter five (twenty-eight).
0000:47 CAM-2	there it is right there.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0000:48 CAM-1	I see it.		
0000:48 CAM-2	stand by twenty-five.		
0000:49 CAM-1	flaps twenty-five.		
0000:50 CAM	[sound of click]		
0000:52 CAM-2	* * * down the runway.		
0000:58 CAM-2	stand by full flaps.		
0001:00 CAM	[sound of GPWS - "Glide slope"]		
0001:02 CAM-2	don't worry about that.		
0001:04 CAM-2	stand by full flaps.		
0001:06 CAM-2	*.		
0001:06 CAM-1	* * fifty.		
0001:07 CAM	[sound of click]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0001:08 CAM-2	all right landing checks.		
0001:11 CAM-2	watch your V speed one twenty-four * down ... gotta get it on the runway.		
0001:17 CAM-2	skid is on.		
0001:20 CAM-2	* before landing, no smoking signals, ignition .. switching, gear is three green, flaps are four fifty, spoilers are forward and de-act ... there's the crash trucks.		
0001:45 CAM-2	a little high.		
0001:48 CAM-2	this is (a little more) runway ... should've braced them in the back.		
0001:54 CAM-2	I think we'll be all right .. get it on the runway and stop with reversers.		
0002:03 CAM	[sound of thump, similar to that of touchdown]		
0002:06 CAM-?	(idle).		
0002:07 CAM	[sound of momentary grind]		
0002:08 CAM	[sound of grinding starts]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0002:11 CAM-?	*.		
0002:28 CAM-?	(braking)?		
0002:30 CAM-?	yeah.		
0002:53 CAM-2	okay reversers.		
0003:00 CAM	[sound of grinding stops]		
0003:01 CAM-2	good it's over.		
0003:02 CAM	[sound of passenger cabin applause]		
0003:04 CAM-2	#.		
0003:07 CAM-?	[sound of exhale]		
0003:08 CAM-2	engine shutdown.		
0003:09 CAM-1	yeah shut 'em.		
0003:10 CAM-2	be prepared to abandon the airplane.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0003:13 CAM-1	whoo wee.		
0003:15 CAM-2	after landing.		
0003:16 PA-3	ladies and gentlemen please remain seated with your seat belts securely fastened ... please do not remove your seat belts.		
0003:18 CAM-2	anti-skid .. off.. flaps and slats.		
0003:22 CAM-1	(what is this?)		
0003:23 CAM-2	do you wanna pick them up?		
0003:24 CAM-1	yeah.		
0003:24 CAM-2	we're sitting mighty low, we must have blown all the tires.		
0003:25 PA-3	ladies and gentleman please do not remove your seat belts. please stay seated with your seat belts securely fastened.		
0003:32 PA-1	ladies and gentlemen we had a ah flight control malfunction ... we've been able to get the aircraft on the ground and stop here on the runway.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0003:38 CAM-2	please be seated.		
0003:38 PA-1	please be seated.		
0003:46 CAM-2	let's see we got the APU up and running .. let's go ahead and shut the engine down ... what do you think?		
0003:50 CAM-1	yeah.		
0003:53 CAM-2	# #.		
0004:00 CAM-2	you shut 'em down Steve?		
0004:00 CAM-1	yeah.		
0004:03 CAM	[sound similar to engine spooldown]		
0004:05 CAM	[sound similar to power interruption to CVR]		
0004:09 CAM-3	you lost your nose wheel.		
0004:10 CAM-2	lost the nose wheel?		
0004:13 CAM-2	we lost the nose wheel.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0004:18 CAM-2	on the runway or ... ?		
0004:20 CAM-3	well right now it's back on the other runway over there .. you didn't have it * * * it was already off.		
0004:26 CAM-2	okay.		
0004:28 CAM-2	we lost the nose wheel.		
0004:30 CAM-1	felt like it.		
0004:33 CAM-2	well, what do we do .. do we abandon?		
0004:37 CAM-1	yeah, we gotta get the people off.		
0004:43 CAM-2	well, you feel like writin' a whole lot?		
0004:45 CAM-1	yeah, guess we're gonna have to ... ah, see if they can get us some transportation for the passengers.		
0004:50 CAM-2	yeah.		
0005:00 CAM	[sound of whistle]		
0005:01 CAM-2	can you call transportation for our passengers * ?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0005:04 CAM	[sound of five knocks]		
0005:05 CAM-3	pardon?		
0005:05 CAM-2	can we get transportation set up for our passengers?		
0005:07 CAM-3	* * * the nose wheel's gone, you're just sittin' down on the axle now.		
0005:11 CAM-2	on the axle?		
0005:12 CAM-3	yeah.		
0005:13 CAM-2	okay.		
0005:14 CAM-3	yeah we'll get * * * *.		
0005:16 CAM-2	thank you .. you might want to see if northwest has a tug they can lift the nose gear up and get us towed.		
0005:27 CAM-2	(or one of those) delta tugs ... we lost the nose wheel.		
0005:30 PA-1	ladies and gentlemen we're going to have to sit here 'till we get some busses out here to transport us over to the terminal ... please stay in your seats, I'll go ahead and turn the seat belt sign off at this time.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0005:43 CAM-2	* * all checklists need to be run.		
0005:45 CAM	[sound of several clicks]		
0005:47 CAM-?	oh #.		
0005:51 CAM-2	(engines) .. lights ... spoilers, APU is cranked and (armed) with the air off.		
0005:56 CAM	[sound of several clicks]		
0006:15 CAM-2	you wanna get outta the airplane or what?		
0006:20 CAM-2	lower the ah rear air air stairs?		
0006:23 CAM-?	[sound of sigh]		
0006:25 CAM-2	the pressure * * * (out).		
0006:27 CAM-1	you sure?		
0006:28 CAM-2	(naw), I I just pulled the window open.		
0006:30 CAM-4	that was * *.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0006:31 CAM-2	you all know how to lower the aft air stairs ... the aft air stairs ... I'll tell you what, our radios don't work .. if we could just get a northwest maintenance person or valujet maintenance -		
0006:42 CAM-3	[mostly unintelligible and intermittent]		
0006:45 PA-4	ladies and gentleman, the captain did requested you to stay in your seat, he just did turn the seat belt sign off well the seat belt sign is off but you do need to stay in your seats please ... return to your seats.		
0006:50 CAM-2	I don't know how the ah main ah stairs will work with the nose wheel so down low.		
0006:54 CAM-1	I don't know either.		
0006:56 CAM-2	I think it's better to go out the ah rear end.		
0006:57 CAM-1	yeah, go out the back.		
0007:01 CAM-2	let's go ahead and unlock this door.		
0007:02 CAM-1	yeah.		
0007:11 CAM-?	(shake it again.)		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0007:15 CAM-1	we're gonna have to go out the back ... out the back.		
0007:18 CAM-4	we are.		
0007:18 CAM-2	but there's no big rush right now.		
0007:20 CAM-1	there's no big rush .. we're gonna get some busses to get over here, ah -		
0007:22 CAM-4	okay, do you know that the floor, the floor board is * up, I -		
0007:26 CAM-5	(can people walk over it?)		
0007:27 CAM-4	I haven't been back there, * * *.		
0007:28 CAM-2	was it the center section?		
0007:29 CAM-?	yeah, above the * *.		
0007:30 CAM-2	yeah, that's the main gear, yeah.		
0007:33 CAM-4	what what happened?		
0007:35 CAM-2	the ground spoilers deployed.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0007:35 CAM-1	we .. the ground spoilers deployed just before we hit.		
0007:38 CAM-4	the what now.		
0007:38 CAM-1	these.		
0007:39 CAM-4	yeah.		
0007:40 CAM-1	okay .. they deployed-		
0007:41 CAM-2	they went out in the air.		
0007:43 CAM-1	and ah -		
0007:44 CAM-4	I think my ribs are broken.		
0007:47 CAM-2	is anybody hurt in the back?		
0007:48 CAM-5	um ... no, um the people would just really like to know what's going on.		
0007:53 CAM-1	okay.		
0007:55 CAM-5	I'm sorry -		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0007:55 CAM-1	that's all right.		
0007:56 CAM-2	if we knew we could tell 'em.		
0007:58 PA-1	ladies and gentleman, as soon as we get some ground transportation we'll be able to get off the aircraft .. it's pretty cold outside, we're gonna have to stay here until we get some busses to depart you up to the terminal ... thank you for your patience.		
0008:07 CAM-4	so it was the airplane that something went wrong with, right?		
0008:09 CAM-2	yeah, the ground spoilers came up in flight .. that's why we just “school” ... sunk right out of sight.		
0008:16 CAM-?	ah.		
0008:20 CAM-4	my ribs are hurting so bad.		
0008:21 CAM-1	yeah.		
0008:22 CAM-?	* * *.		
0008:22 CAM-4	my side is sore.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0008:23 CAM-5	I think we did well ... I mean you guys did a great job.		
0008:25 CAM-2	well we lost both radios.		
0008:28 CAM-4	are your nerves shot yet Steve?		
0008:29 CAM-1	no they're not shot yet.		
0008:35 CAM-2	let's see ... terminating checklist?		
0008:37 CAM-1	yeah.		
0008:38 CAM	[sound of female chuckle]		
0008:39 CAM-4	what is that your contact?		
0008:40 CAM-5	no, it was my eye (dripping) ... now my eyelid's really (fried in shrimp).		
0008:44 CAM-2	* ... transponder stand by ... fire warning, don't have to do all that.		
0008:56 CAM-2	I want to get out of this thing and take a look, make sure we're not leaking fuel.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0008:59 CAM-1	go ahead.		
0009:00 CAM-2	* * * the after air stairs ... I can try the ah main door.		
0009:15 CAM-2	is everybody okay?		
0009:18 CAM-2	okay ... * * we're trying to get the busses out here to get you off * terminal.		
0009:38 CAM-1	that's my jacket ... * *.		
0009:59 CAM-3	we got (stairs) problem.		
0010:00 CAM-2	okay ... we leaking any fuel?		
0010:06 CAM	[several minutes of mostly unintelligible and intermittent background conversation between cam-2 and ground crew concerning aft air stair operation]		
0012:07 CAM-4	so what was it that happened, Bob.		
0012:09 CAM-2	the ground spoilers that deploy when you land, when you touch down they come up automatically, they came up in flight, right over the approach lights ... the airplane just sunk out of sight.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0012:21 CAM-?	[mostly unintelligible and intermittent]		
0012:25 CAM-2	we hit really hard ... the airplane is damaged, there's no nose wheel on it ... there's no tire on the nose wheel.		
0012:34 CAM-4	* * * did we land with no tires?		
0012:35 CAM-2	yeah .. *.		
0012:36 CAM-4	I knew we did, I knew (it hurt bad), that's what I told her I said oh my God, I said * the (spoilers) and landing gear.		
0012:41 CAM-2	* nose wheel.		
0012:45 CAM	[start of mostly unintelligible and intermittent background conversation]		
0016:07 CAM-1	about how long before we get some transportation, you think?		
0016:10 CAM-3	[unintelligible]		
0016:17 PA-1	ladies and gentleman, the ground transportation is on its way and as soon as it gets here we will be able to de-plane.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0016:23 CAM	[continuation of mostly unintelligible and intermittent background conversation]		
0017:29 CAM-1	let's sit down and make some notes.		
0017:31 CAM-2	yup .... wonder what to tell the people in the back, * * explanation *.		
0017:57 CAM-1	gear down, * * * *.		
0018:04 CAM-1	about where did you notice this -		
0018:09 CAM-2	oh I didn't even see it, I knew what it was when we started sinking out of sight.		
0018:13 CAM-6	should be about five more minutes * * *.		
0018:14 CAM-?	okay.		
0018:17 PA-1	ladies and gentlemen, in about five more minutes we should have a bus here to take us up to the terminal .. thank you for your patience.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0018:26 CAM-2	I knew what it was * * as soon as you pushed it in I said there goes the cabin, it started to open up, it got a ground signal is what it got, gave this * a signal to deploy when you pushed it in. This is misleading. It tells you to reset 'em but you reset them probably after you're on the ground but it doesn't say that.		
0019:12 CAM-2	did you try the nose steering though after it didn't - ?		
0019:13 CAM-1	yeah yeah did try -		
0019:15 CAM-2	so we retracted.		
0019:37 CAM-2	did you notice if we had four lights when reversing?		
0019:42 CAM-1	I don't even remember.		
0019:50 CAM-2	we lost oil quantity in the right engine.		
0020:08 CAM	[sound of power interruption to CVR]		
0020:12 CAM-1	you reached over and stowed these on go around, huh?		
0020:14 CAM-4	yeah.		
0020:14 CAM-6	captain, somebody here looking for you.		

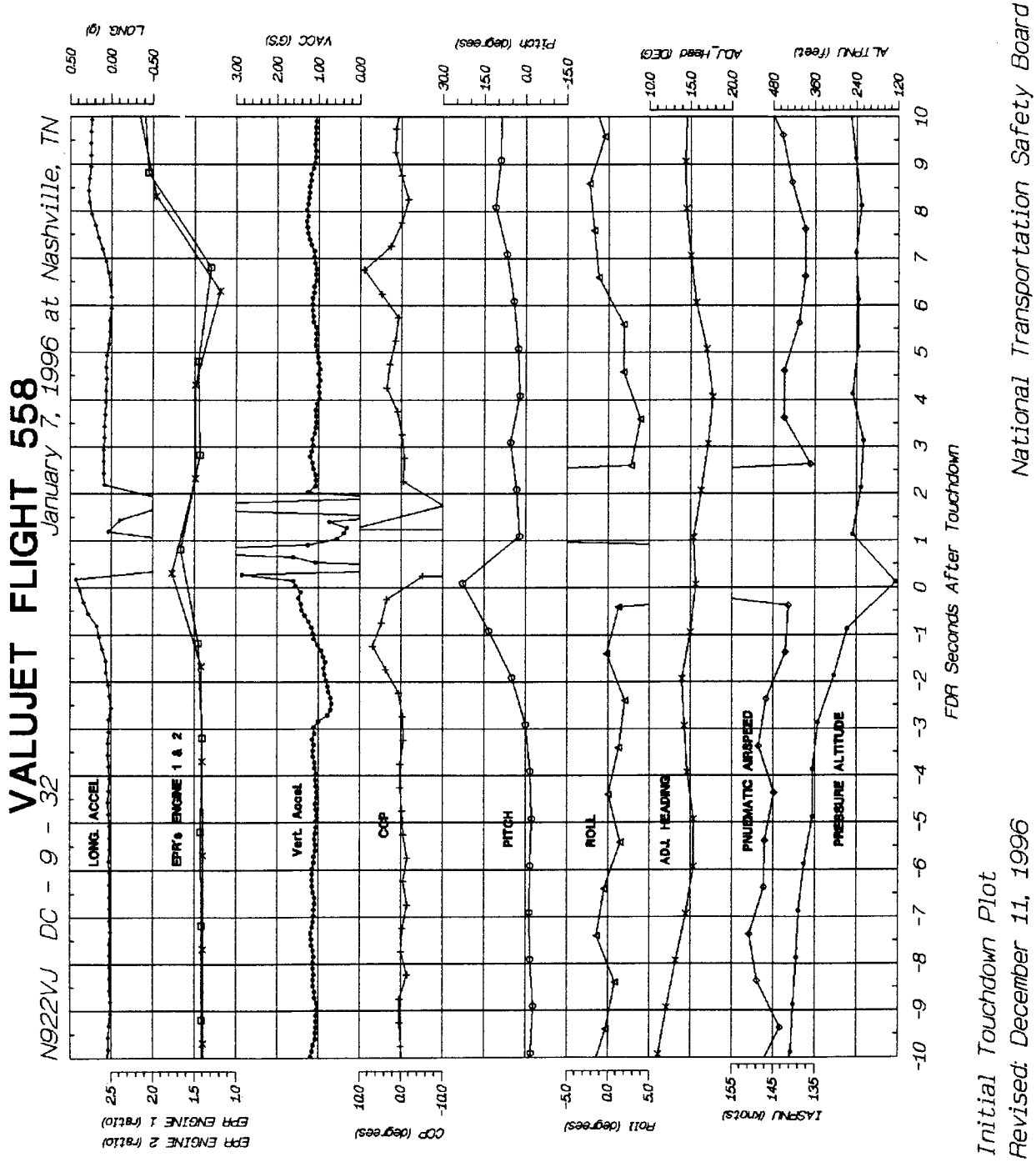
INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0020:15 CAM-1	alright.		
0020:17 CAM	[start of mostly unintelligible and intermittent background conversation]		
0020:56 CAM-2	it's not working, it's not working here.		
0021:25 CAM-1	yeah yeah it's on.		
0021:30 CAM-2	that's electric * that's not hydraulic.		
0021:34 CAM-1	* * raise it.		
0022:03 CAM-2	is it coming out now?		
0022:04 CAM-1	yeah.		
0023:05 PA-1	okay ladies and gentlemen, the busses have arrived here and if you would, very carefully, we're ready to depart the aircraft .. please get your bags and take your bags with you.		
0023:25 CAM-1	eighty-six or eighty-five?		
0023:27 CAM-?	eighty-six.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0023:50 CAM-2	are the stairs locked, got the rails up?		
0023:53 CAM-1	yeah the rails are up.		
0023:55 CAM	[start of mostly unintelligible and intermittent passenger background conversation during passenger de-planing]		
0025:22 CAM-2	engine and wing anti-ice off.		
0025:29 CAM-?	D.C. busses off?		
0025:39 CAM-2	don't have any oil ... right CSD low.		
0025:45 CAM	[unintelligible]		
0026:07 CAM-2	so you didn't feel any movement on the - so you raised the gear pushed the button and raised the gear, we read the checklist -		
0026:12 CAM-1	soon as I did that, the second time over here		
0026:14 CAM	[start of mostly unintelligible and intermittent passenger background conversation during passenger de-planing]		
0026:50 CAM-2	I * * * fire trucks anyway, in case we had to evacuate.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0027:07 CAM-2	hey you okay ... you just, it's just nerves right now okay .. you're gonna be shaking all over like a leaf in a few minutes, okay.		
0027:37 CAM-7	little more airspeed on approach.		
0027:40 CAM-2	that wasn't it.		
0027:50 CAM-8	okay guys, you all did a great job, thank you.		
0027:52 CAM-1,2	thank you.		
0027:56 CAM-2	get out that video camera and film that nose wheel.		
0028:01 CAM	[sound of several power interruptions to the CVR]		
0028:24 CAM-2	when everybody's off should we shut this APU down?		
0028:26 CAM-1	(yeah.)		
0028:27 CAM-?	* *.		
0028:36 CAM-4	we had a lot of way before we really had to stop though, didn't we?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0028:39 CAM-1	hmmm?		
0028:42 CAM-4	or should we have stopped * *.		
0028:54 CAM-2	it was eleven thousand feet, what did we have left, four thousand?		
0029:01 CAM-2	used almost seven thousand.		
0029:15 CAM-2	* * *.		
0029:33 CAM-2	we got enough vans?		
0029:57 CAM-9	we got we we caught the brunt of it back there in the back.		
0030:02 CAM-1	we did de-pressurize, right?		
0030:02 CAM-2	yeah, well, it was working normal, the pressurization .. I mean we set the cabin down it came down it was down to sea level .. and then when you pushed the breakers in, the outflow valve went to full open which de-pressurized the airplane but at the same time -		
0030:26 [end of recording]			
0030:26 [end of transcript]			

APPENDIX C - VALUJET FLIGHT 558 DIGITAL FLIGHT DATA RECORDER DATA PLOT



APPENDIX D - AIR TRAFFIC CONTROL TRANSCRIPT AND STATEMENTS

Memorandum

U.S. Department
of Transportation

Federal Aviation
Administration

Subject: INFO RMATION: Transcript;
Reference Aircraft Accident; VJA558;
Nashville, TN; January 7, 1996

Date: February 6, 1996

Reply to
Attn of:

From: Manager, Nashville ATCT, BNA-2

TO: This transcript covers the Nashville ATCT Departure Radar West Control position for the time period from January 7, 1996, 2201 UTC to January 7, 1996,2230 UTC.

Agencies Making Transmissions	Abbreviations
Nashville ATCT, Departure Radar West	DRW
Nashville ATCT, Local Control One	LC1
Memphis ARTCC	ZME
Valujet 558	VJA558
Beechjet 445CC	N445CC
Eagleflight 533	EGF533
Southwest 1364	SWA1364
United 1417	UAL1417
American 1323	AAL1323
Northwest 1470	NWA1470
Cessna Citation 72WE	N72WE
Cessna Centurion 210RG	N21ORG
PAT505 (Military)	PAT505
USAir 1578	USA1578
Southwest 1263	SWA1263
Bonanza 25466	N25466
Cherokee Archer 2070M	N2070M

I hereby certify that the following is a true transcription of the recorded conversations pertaining to the subject aircraft accident involving VJA558.

Dianne P. Reid
Quality Assurance and Training Specialist
February 6, 1996

2201		
2201:17	N445CC	*(and) nashville beechjet four four five charlie charlie
2201:20	DRW	beechjet four four five charlie charlie nashville approach expect vectors for the i 1s runway three one approach descend and maintain six thousand advise when you have arrival information charlie
2201:31	N445CC	*(ok) we have charlie down to six thousand expect thirty one and apparently uh we lost frequency with the last controller
2201:38	DRW	roger dld you pickup the new frequency over the vortac
2201:41	N445CC	no sir we looked up on the uh on the arrival
2201:44	DRW	roger
2201:47	DRW	nashville nashville seventy three I've got four forty five charlie charlie and he's descending
2201:51	ZME	alright thank you very much (unintelligible)
2202:00	DRW	beechjet four four five charlie charlie turn left heading two zero zero descend at pilot's discretion maintain three thousand and it'll be vectors for i 1s runway two right be vectors for ils runway two right approach braking action was reported fair by seven thirty seven

2202:16	N445CC	o k uh two hundred degrees on the heading three thousand and two right now
2202:23	EGF533	departure eagleflight five thirty three is in a right turn to zero nine zero
2202:28	DRW	eaglefight five thirty three nashville departure radar contact
2202:47	DRW	beechjet five charlie charlie amend altitude descend and maintain six thousand fly heading two three zero
2202:53	N445CC	two thirty at six thousand charlie charlie
2202;59	DRW	eagleflight five thirty three climb and maintain five thousand turn right heading of one five zero
2203:05	EGF535	five zero and up to five five thirty three
2203:09	DRW	eagleflight six seventy seven contact memphis center one three two point one so long
2203:14	EGF677	one thirty two point one eagle six seventy seven we'll see you later
2203:30	SWA1364	south thirteen sixty four with you out of sixteen hundred climbing to five thousand
2203:49	DRW	*(southwest) thirteen sixty four nashville were you checking in
2203:53	SWA1364	affirmative out of twenty six hundred for five thousand

2202:16	N445CC	o k uh two hundred degrees on the heading three thousand and two right now
2202:23	EGF533	departure eagleflight five thirty three is in a right turn to zero nine zero
2202:28	DRW	eagleflight five thirty three nashville departure radar contact
2202:47	DRW	beechjet five charlie charlie amend altitude descend and maintain six thousand fly heading two three zero
2202:53	N445CC	two thirty at six thousand charlie charlie
2202:59	DRW	eagleflight five thirty three climb and maintain five thousand turn right heading of one five zero
2203:05	EGF535	five zero and up to five five thirty three
2203:09	DRW	eagleflight six seventy seven contact memphis renter one three two point one so long
2203:14	EGF677	one thirty two point one eagle six seventy seven we'll see you later
2203:30	SWA1364	south thirteen sixty four with you out of sixteen hundred climbing to five thousand
2203:49	DRW	*(southwest) thirteen sixty four nashville were you checking in
2203:53	SWA1364	affirmative out of twenty six hundred for five thousand

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2203:57	DRW	southwest thirteen sixty four nashville departure radar contact climb and maintain seven thousand turn left headiig of two six zero
2204:06	SWA1364	southwest thirteen sixty four seven thousand left heading two six zero
2204:57	UAL1417	united fourteen seventeen uh with you uh out of uh eighteen hundred for five thousand
2205:05	DRW	is that united fourteen seventeen
2205:08	UAL1417	affirmative
2205:09	DRW	united fourteen seventeen nashville departure radar contact climb and maintain one five fifteen thousand
2205:16	UAL1417	cleared to one five thousand united uh fourteen seventeen
2205:20	DRW	southwest thirteen sixty four traffic twelve thirty two miles northwest bound eight thousand centurion
2205:26	SW1364	southwest thirteen sixty four *(that traffic passed us)
2205:32	DRW	eagleflight five thirty three when you're able direct rome climb and maintain one five thousand
2205:42	EGF533	o k was that one five thousand for five thirty three

2205:44	DRW	eagle five thirty three affirmative climb and maintain one five thousand direct rome
2205:50	EGF533	direct rome (unintelligible) one five thousand five thirty three
2205:53	DRW	united fourteen seventeen turn left heading uh three six zero when you're able direct (unintelligible) is it walnut ridge
2206:00	UAL1417	uh left turn uh uh three sixty and uh we'd like to go direct Louisville
2206:04	DRW	I'm sorry direct Louisville for united fourteen seventeen
2206:08	UAL1417	(unintelligible)
2206:08	DRW	southwest thirteen sixty four climb and maintain one five thousand direct walnut ridge for you when you're able
2206:13	SW1364	thirteen sixty four one five thusand walnut ridge when able
2206:16	VJA558	critter five fifty eight with you one zero uh one two thousand (unintelligible)
2206:19	AAL1323	thirteen twenty three twenty five hundred for five
2206:23	DRW	critter five fifty eight turn left heading two eight zero descend and maintain five thousand vectors i 1 s runway two right

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2206:31	VJA558	eight zero down to five thousand expect two right critter five fifty eight
2206:35	DRW	eagle flight five thirty three turn left heading of one two zero vector around traffic
2206:40	EGF533	two zero five thirty three
2206:40	DRW	five charlie charlie descend and maintain three thousand
2206:45	445CC	three thousand five charlie charlie
2206:49	DRW	american thirteen twenty three nashville departure radar contact climb and maintain one five thousand turn left heading two six zero
2206:57	AAL1323	left two six zero climb to one five thousand american thirteen twenty three
2207:02	DRW	southwest thirteen sixty four contact memphis center on one two five point eight five so long
2207:09	SWA1364	thirteen sixty four twenty five eight five good day
2207:46	NWA1470	nashville approach northwest fourteen seventy ten thousand with delta.

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2206:31	VJA558	eight zero down to five thousand expect two right critter five fifty eight
2206:35	DRW	eagle flight five thirty three turn left heading of one two zero vector around traffic
2206:40	EGF533	two zero five thirty three
2206:40	DRW	five charlie charlie descend and maintain three thousand
2206:45	445CC	three thousand five charlie charlie
2206:49	DRW	american thirteen twenty three nashville departure radar contact climb and maintain one five thousand turn left heading two six zero
2206:57	AAL1323	left two six zero climb to one five thousand american thirteen twenty three
2207:02	DRW	southwest thirteen sixty four contact memphis center on one two five point eight five so long
2207:09	SWA1 364	thirteen sixty four twenty five eight five good day
2207:46	NWA1470	nashville approach northwest fourteen seventy ten thousand with delta.

2207:51	DRW	northwest fourteen seventy nashville approach roger expect vectors i 1s runway two right braking action reported good by a uh seven thirty seven correction braking action reported fair by a seven thirty seven
2208:03	NWA1470	*(o k) copy northwest fourteen seventy
2208:06	DRW	beechjet five charlie charlie turn right heading two niner zero braking action reported fair by a seven thirty seven
2208:11	N445CC	right turn (unintelligible) braking action fair thank you sir
2208:15	NWA1470	and approach northwest fourteen seventy
2208:19	DRW	united fourteen seventeen contact memphis center one three three point eight five
2208:23	UAL1417	thirty three eight five united fourteen seventeen good day
2208:27	DRW	northwest fourteen seventy fly heading one three zero descend at pilot's discretion maintain five thousand go head
2208:32	NWA1470	okay uh one thirty heading uh down to five thousand uh you're winds still at three twenty at uh fourteen
2208:38	DRW	critter five fifty eight turn right heading of three one zero

2208:41	VJA558	three one zero critter five fifty eight
2208:43	DRW	eagle flight five thirty three you can proceed direct rome when you're able contact memphis center on one two six point seven five
2208:5 1	EGF533	twenty six seventy five direct rome five thirty three
2208:53	DRW	beechjet five charlie charlie you're seven miles from skaggs turn right heading thru five zero maintain three thousand until established on the localizer cleared i 1s runway two right approach
2209		
2209:02	N445CC	three live zero three thousand cleared uh for the i 1s two right approach
2209:06	DRW	northwest fourteen seventy the winds are three three zero at one three
2209:10	NWA1470	yes sir I'd like to request runway three one
2209:13	DRW	united fourteen seventy expect vectors i ls runway three one approach
2209:17	NWA1470	ah northwest fourteen seventy roger
2209:23	LC1	local
2209:24	DRW	northwest won't take two right he wants thirty one because of the wind

2209:27	LC 1	that's fine
2209:27	DRW	s k
2209:28	LC 1	d g
2209:44	DRW	american thirteen twenty three uh turn left heading of two four zero join jay forty six
2209:51	AAL1323	left two four zero join jay forty six american thirteen twenty three
2209:55	DRW	american thirteen twenty three contact memphis center on one two five point eight five so long
2010		
2010:01	AAL1323	twenty five eighty five *(american thirteen twenty three)
2010:04	DRW	beechjet five charlie charlie contact tower on one one eight point six
2010:10	445CC	one one eight point six charlie charlie good day
2011		
2011:27	DRW	critter five fifty eight descend and maintain three thousand
2011:29	VJA558	three thousand critter five fifty eight
2011:32	ZME	nashville shelby on the three
2011:34	DRW	nashville

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2011:35	ZME	that two whiskey echo I turned him inside that eagle jet there he's heading uh three four zero your control
2011:40	DRW	thank you b r
2011:40	ZME	(unintelligible)
2012		
2012:06	N72WE	nashville approach citation seven two whiskey echo
2012:13	DRW	citation seven two whiskey echo nashville approach expect an i 1s approach runway two right at nashville braking action reported fair by a seven thirty seven and uh you say you have information delta
2012:25	N72WE	that's affirmative sir and uh that was expect uh two right
2012:28	DRW	affirmative
2012:41	DRW	northwest uh fourteen seventy turn left heading one one zero
2012:45	NWA1470	left heading one one zero northwest fourteen seventy
2012:55	DRW	and northwest fourteen seventy descend and maintain four thousand
2012:59	NWA1470	out of four thousand northwest fourteen seventy
2213:02	DRW	critter five fifty eight turn ten degrees right

2213:04	VJM58	turn ten degrees right critter five fifty eight
2213:10	DRW	(unintelligible) make that heading three four zero
2213:13	VJA558	four zero critter five fifty eight
2213:26	DRW	northwest uh fourteen seventy you're (unintelligible) you're number two for the airport I've got a uh d c nine inbound runway two right I'll be (unintelligible) about ten mile final
2213:33	NWA1470	*(o k) copy northwest fourteen seventy
2213:41	DRW	seven two whiskey echo center gave you a three four zero heading is that correct
2213:46	N72WE	thats correct sir (unintelligible)
2213:48	DRW	o k you can expect three forty heading for awhile that will be vectors to the final approach course
2213:52	N72WE	o k sir maintain three forty for now then seven uh seven two whiskey echo
2213:57	DRW	if you need something else let me know
2214		
2214:05	N72WE	uh whiskey echo roger
2214:10	DRW	centurion two one zero romeo golf contact memphis center one three three point eight five
2214:21	DRW	centurion two one zero romeo golf contact memphis center one three three point eight five

2214:27	N2 1ORG	three three eight five four romeo golf
2214:35	DRW	critter five fifty eight whats your ah speed now
2214:39	VJA558	speed now two thirty
2214:40	DRW	thank you
2214:41	DRW	northwest fourteen seventy reduce speed to two one zero
2214:44	NWA1470	and reduce to two one zero for northwest fourteen seventy
2214:47	DRW	thank you
2214:48	DRW	critter five five eight is uh five miles from skaggs turn right heading three five zero maintain three thousand until established on the localizer cleared i 1s approach runway two right speed one seven zero or greater til skaggs please.
2214:59	VJA558	(unintelligible) three five zero three thousand til established cleared for approach critter five fifty eight
2215:10	DRW	and critter five fifty eight traffic eleven o'clock and four miles is a northwest d c nine at four thousand inbound for runway three one
2215:17	VJA558	five fifty eight (unintelligible) he should be above us in the clouds
2215:20	DRW	(unintelligible) above you

2215:23	DRW	seven two whiskey echo descend and maintain three thousand
2215:27	N72WE	roger out of one zero thousand for three thousand whiskey echo
2215:31	DRE	and uh citation seven two whiskey echo thats at your discretion
2215:35	N72WE	o k sir its three thousand at pilots discretion
2215:37	DRW	(unintelligible)
2215:38	N72WE	*(echo)
2215:39	DRW	affirmative
2215:47	DRW	northwest fourteen seventy there's a d c nine uh just uh off your uh right side just going behind three thousand now inbound for two right
2215:55	NWA1470	and we're in the clouds northwest fourteen seventy
2216:00	DRW	I'll have lower for you just a moment
2216:10	LC1	local
2216:11	DRW	ten south on northwest fourteen seventy I guess they filled you in he's three one
2216:15	LC1	yeah

2216:15	DRW	o k here he comes
2216:16	LC 1	d g
2216:16	DRW	b r
2216:22	DRW	northwest fourteen seventy turn left heading zero eight zero
2216:27	NWA1470	turning zero eight zero northwest fourteen seventy
2216:47	DRW	critter five fifty eight contact nashville tower one two eight point one five
2216:51	VJA558	two eight on five critter five fifty eight switching
2216:53	DRW	northwest fourteen seventy descend and maintain three thousand
2216:56	NWA1470	*(down to) three thousand northwest fourteen seventy
2217		
2217:21	PAT505	departure pat five zero fives with you out of fifteen hundred for four thousand
2217:25	DRW	pat five zero five nashville departure radar contact climb and maintain one five thousand
2217:30	PAT505	up to one five thousand pat five zero five thanks

2217:36	DRW	northwest fourteen seventy continue descent to maintain two thousand six hundred
2217:40	NWA1470	down to two thousand six hundred northwest fourteen seventy
2217:48	DRW	and northwest fourteen seventy turn left heading three three zero you're uh five miles from ayers maintain two thousand six hundred until establish on the localizer cleared for i 1s approach runway three one
2218:00	NWA1470	a left turn heading three three zero two thousand six hundred til establish (unintelligible) northwest fourteen seventy
2218:01	USA1578	good afternoon nashville approach u s air fifteen seventy eight *(thirteen five for) one zero thousand with delta
2218:07	DRW	us air fifteen seventy eight nashville approach expect an i 1s approach runway two right braking action reported fair by a seven thirty seven
2218:15	USA1578	is thirty one available for fifteen seventy eight
2218:17	DRW	uh well they want they're trying to get it uh plowed right now I'll let you know as you get closer
2218:22	USA1578	*(ok) we'll expect two right and if three one comes available we'd like that thanks

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2218:51	DRW	pat five zero five proceed on course
2218:54	PAT505	five zero five on course thanks
2219		
2219:05	DRW	citation seven seven two whiskey echo turn left heading three one zero
2219:10	N72WE	left three one zero uh two whiskey echo
2219:21	SWA1 263	roger southwest twelve sixty three one point four for five thousand
2219:24	DRW	southwest twelve sixty three nashville departure radar contact climb and maintain one five thousand
2219:31	SWA1263	*(climb maintain) one five thousand southwest twelve sixty three
2219:42	DRW	southwest twelve sixty three uh leaving three thousand uh five or (intelligible) six hundredturn left heading three six zero to join jay thirty nine
2219:53	SWA1263	three thousand six hundred turn left to heading three six zero uh join jay
2219:59	SWA1263	(unintelligible)
2220		
2220:02	DRW	northwest fif uh fourteen seventy you're gonna join about a mile from ayers contact the tower one one eight point six
2220:09	NWA1470	(unintelligible) mile from ayers uh eighteen six for tower for northwest fourteen seventy

2220:35	DRW	u s air fifteen seventy eight descend and maintain six thousand
2220:39	USA1578	leaving one zero thousand for six thousand us air fifteen seventy eight
2221		
2221:38	DRW	go around
2221:39	LC 1	ah it's a whole lot more serious than that we'll call you back
2221:41	DRW	o k
2221:47	DRW	*(november) seven two whiskey echo they just closed runway two right so uh turn right heading uh one one zero I'll try to take you to three one
2221:56	N72WE	*(o k) right one one zero (unintelligible) whiskey echo
2221:57	LC1	knocked the antenna off
2221:58	DRW	can I use three one
2222:00	LC1	uh I wouldn't do anything right now this guy lost his nose wheel
2222:03	DRW	yeah
2222:04	LC1	uh he's got no tires on the nose gear he came up short of the runway hit the tail and I can't talk to him

2222:11	DRW	o k
2222:11	LC 1	uh I don't know what he's goma do pat so just the altitude is apparently good he may have knocked the antenna off the airplane I can't talk to him
2222:18	DRW	o k
2222:19	LC 1	so stay out of his way
2222:20	DRW	alright but I've got a couple of inbounds can I use three one still
2222:24	LC 1	thirty one's good but I don't know what critters gonna do
2222:25	DRW	o k
2222:28	DRW	critter five fifty eight (unintelligible) approach
2222:59	DRW	seven two whiskey echo turn left heading (unintelligible) zero niner zero
2223:02	N72WE	left zero niner zero on uh whiskey echo
2223:09	DRW	the uh localizer frequency for three one is one hundred nine point seven
2223:14	N72WE	one zero nine point seven thank you whiskey echo
2223:19	DRW	anything on critter yet

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2223:21	LC 1	I can't get him I can't get him on guard either
2223:23	DRW	o k
2223:23	LC 1	so watch him
2223:24	DRW	I'm watching him
2223:24	LC 1	alright
2223:26	DRW	us air fifteen seventy (unintelligible) runway three one now fly heading one niner zero
2223:31	USA1578	one nine zero for runway three one us air fifteen seventy eight *(thank you sir)
2223:46	DRW	southwest twelve sixty three contact memphis center on ah one three three point eight five
2224		
2224:01	DRW	southwest twelve sixty three contact memphis center one two one three three point eight five
2224:06	SW1263	(unintelligible) three three eight five southwest twelve sixty three
2224:11	DRW	us air fifteen seventy reduce your speed to one seven zero
2224:15	USA1578	one seventy us air fifteen seventy eight
2224:17	DRW	pat five zero five contact memphis center one two five point eight five

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2224:21	PAT505	one two five eight five pat five zero five good day
2225		
2225:12	DRW	(unintelligible) seven two whiskey echo uh expect vectors to the final approach course there is a uh emergency inbound
2225:15	N72WE	seven two whiskey echo roger
2225:22	DRW	us air fifteen seventy eight turn right heading one three zero correction uh turn left heading one three zero
2225:28	USA1578	one three zero us air fifteen seventy eight
2225:30	DRW	affirmative
2225:37	N25466	nashville approach bonanza two five four six six level at nine thousand
2225:41	DRW	bonanza two five four four uh four six six nashville altimeter three zero one four
2225:48	N25466	zero one four
2225:49	DRW	and uh seven two whiskey echo and us air fifteen seventy eight looks like uh it looks like the uh three one might be closed in just a moment here let me know if you have any uh different airport to go to
2226		
2226:03	N72WE	whiskey echo roger

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2226:06	USA1578	ah what uh you're saying the whole airport's gonna be closed
2226:09	DRW	I got I got the feeling it will be two right just closed and (unintelligible) emergency is landing three one
2226:17	DRW	seven two whiskey echo turn right heading uh one two zero
2226:22	N72WE	right one two zero whiskey echo
2226:24	DRW	I'll just vector you back around in a moment
2226:28	N72WE	O k thank you
2226:50	DRW	us air fifteen seventy eight do you have an alternate airport you want to go to or do you just want to try to hold for a while
2226:55	USA1578	uh we'd like to uh try to hold for a little while how long do they uh claim the emergency is gonna take to clear up
2227		
2227:01	DRW	well uh (unintelligible) I'll try to explain it to you just a moment but uh turn your turn right to uh I'm gonna hold you uh over dobbs if you don't mind (unintelligible) two left at dobbs can you do that
2227:13	USA1578	hold over dobbs o k we'll have to get that set up uh yeah we can do that
2227:17	DRW	o k uh turn uh to your right (unintelligible) heading two seven zero and when able direct dobbs

2227:22	USA1578	*(ok) two seven zero and when ready direct dobbs u s air uh fifteen seventy eight
2227:27	DRW	seven two whiskey echo you you want to try to hold also
2227:31	N72WE	yes sir we do
2227:32	DRW	alright turn right to a heading of three one zero at three thousand you want to hold uh at dobbs also if you're gonna dial that in
2227:39	N72WE	o k that 'll be fine uh right three one and hold at dobbs
2227:42	DRW	affirmative when able direct dobbs I'll just hold you there and peel you back out to go over to uh runway uh three one or to whatever runway opens up again
2227:50	N72WE	o k sir three one zero uh and then direct dobbs to hold
2227:53	DRW	affirmative
2227:55	DRW	us air fifteen seventy eight when you get to dobbs hold south west of dobbs on the two left final approach course at six thousand legs at your discretion right as left turns and expect further clearance at uh let's make it two three zero zero now is two two two eight
2228:10	USA1578	o k understand uh once we get to dobbs hold uh southwest on the uh two left final approach course right or left turns our choice ten mile legs o k

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VJA558
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2228:20	DRW	affirmative
2228:20	USA1578	and (unintelligible) approach at twenty three hundred
2228:23	DRW	affirmative
2228:39	DRW	and uh looks and right now the uh aircraft just touched down and uh lost the nose wheels two right and they're gonna inspect it and they just they just landed on on runway three one so three one is closed and the right is closed well all the tunways are closed right now so I'll try to figure out what going to open up first and take ya'll over there
2228:55	USA1578	*(thanks)
2228:55	N72WE	*(whiskey echo)
2229		
2229:18	DRW	uh seven two whiskey echo when reaching dobbs hold southwest of dobbs on the two left uh localizer and uh maintain three thousand left or right turns approved legs at your discretion expect further clearance at uh two three three two three zero five the time now is two two two niner
2229:38	N72WE	seven two whiskey echo roger
2229:42	N2070M	nashville archer two zero seven zero mike at eight thousand
2229:46	DRW	archer two zero seven zero mike nashville approach altimeter three zero one four
2230		
2230:04	ZME	west arrival three uh two line

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VJA558
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2230:10	DRW	nashville
2230:1 I	ZME	yes I understand you've got one disabled on the runway
2230:14	DRW	uh we have no open runways right now
2230:16	ZME	none at all they're all closed
2230:18	DRW	everyone of them yes
2230:19	ZME	o k we'll hold everything else outside your airspace
2230:21	DRW	also I've got (unintelligible) overflights but no arrivals
2230:23	ZME	o k you've got no arrivals which one was it
2230:26	DRW	uh it was critter five fifty eight
2230:28	ZME	critter o k
2230:29	DRW	they'll call you and let you know what happened pretty soon
2230:31	ZME	thank you
2230:32	DRW	right now I can't I don't have the time
2230:34	ZME	r j

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2230:34 DRW br

End of Transcript

This portion of the rerecording is not entirely clear, but this represents the best interpretation possible under the circumstances.

Memorandum

U.S. Department
of Transportation
Federal Aviation
Administration

Subject: INFORMATION: Transcript; Reference Aircraft Accident; VJA558; Nashville, TN; January 7, 1996

Date: February 6, 1996

From: Manager, Nashville ATCT, BNA-2

Reply to
Attn of:

To: This transcript covers the Nashville ATCT Local Control One position for the time period from January 7, 1996, 2212 UTC to January 7, 1996, 2230 UTC.

Agencies Making Transmissions	Abbreviations
Nashville ATCT, Local Control One	LC 1
Nashville ATCT, Departure Radar West	DRW
Valujet 558	VJA558
Beechjet 445CC	N445CC
PAT505 (Military)	PAT505
Southwest 1263	SWA1263
Northwest 1470	NWA1470

I hereby certify that the following is a true transcription of the recorded conversations pertaining to the subject aircraft accident involving VJA558.

Dianne P. Reid
Dianne P. Reid
Quality Assurance and Training Specialist
February 6, 1996

2212		
2213:00	N445CC	wind check please
2213:02	LC 1	wind three three zero at one four

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VJA558
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2213:28	LC 1	o k thanks uh still out of the northwest about three hundred thirty
2213:32	N445CC	affirm
2213:33	LC 1	O k thanks
2214		
2214:17	LC 1	beechjet five charlie charlie turn lefi when able to contact ground point niner
2214:21	N445CC	charlie charlie
2215		
2215:33	PAT505	tower pat five zero five is ready to go two right
2215:35	LC 1	pat five zero five nashville tower turn left heading two eight zero runway two right cleared for takeoff
2215:40	PAT505	left two eight zero cleared for takeoff pat five zero five
2216		
2216:10	LC 1	local
2216:11	DRW	ten south on northwest fourteen seventy I guess they filled you in he's three one
2216:15	LC1	yeah
2216:15	DRW	o k here he comes
2216:16	LC1	d g
2216:16	DRW	br
2217		
2217:01	LC1	pat five zero five contact departure good day

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VJA558
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2217:04	PAT505	five zero five good day
2217:05	LC 1	southwest twelve sixty three nashville tower fly the nashville eight departure runway two right cleared for takeoff
2217:11	SWA1263	nashville eight departure cleared for takeoff southwest twelve sixty three
2217:18	VJA558	(unintelligible) critter five fifty eight is with you uh for a i l s runway two right
2217:21	LC 1	critter five fifty eight nashville tower runway two right clear to land
2217:24	VJA558	cleared to land two right critter five fifty eight
2218		
2219		
2219:10	LC 1	southwest twelve sixty three contact departure good day
2219:14	SW1263	good day southwest twelve sixty three
2219:17	LC1	critter five fifty eight a beechjet reported the braking action poor at the approach end of the runway and then uh becoming fair down field
2219:25	VJA558	five fifty eight roger
2219:35	VJA558	*(is) this nashville minnesota
2219:37	LC 1	say again

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VJA558
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2219:38	VJA558	is this minnesota
2219:40	LC 1	I still didn't hear ya
2219:42	VJA558	disregard
2220		
2220:18	NW1470	nashville tower northwest fourteen seventy is eight miles out for the i 1 s three one
2220:37	LC 1	critter five fifty eight you've lost the uh two wheels off the nose gear
2221		
2221:05	NW1470	*(Nashville) tower northwest fourteen seventy six miles out i 1 s thirty one
2221:09	LC 1	northwest fourteen seventy nashville tower continue
2221:13	NWA1470	fourteen seventy continue
2221:17	LC 1	critter five fifty eight uh did you copy
2221:32	LC 1	northwest fourteen seventy runway three one cleared to land
2221:35	NWA1470	(unintelligible) northwest fourteen seventy
2221:38	DRW	go around
2221:39	LC 1	uh it's a whole lot more serious than that we'll call you back
2221:41	DRW	o k

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VJA558
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2221:46	LC1	critter five fifty eight tower
2221:57	LC 1	knocked the antenna off
2221:58	DRW	can I use three one then
2222:00	LC 1	uh I wouldn't do anything right now this guy lost his nose wheel
2222:03	DRW	yeah
2222:04	LC1	uh he's got no tires on the nose gear he came up short of the runway hit the tail and I can't talk to him
2222:11	DRW	o k
2222:11	LC1	uh I don't know what he's gonna do pat so just the altitude is apparently good he may have knocked the antenna off the airplane I can't talk to him
2222:18	DRW	o k
2222:19	LC1	so stay out of his way
2222:20	DRW	all right but I've got a couple of inbounds can I use three one still
2222:24	LC 1	yeah thirty one's good but I don't know what critters gonna do
2222:25	DRW	o k

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VJA558
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2222:29	LC 1	critter five fifty eight nashville tower
2223		
2223:19	DRW	anything on critter yet
2223:21	LC1	I can't get him I can't get him on guard either
2223:23	DRW	o k
2223:23	LC 1	so watch him
2223:24	DRW	I'm watching him
2223:24	LC 1	all right
2223:45	LCI	critter five fifty eight nashville tower
2223:57	LC1	northwest fourteen seventy turn right when able to contact ground point niner
2224		
2224:01	NWA1470	turn right ground point nine northwest fourteen seventy
2225		
2225:51	LC1	critter five fifty eight if you hear the tower you have no wheels negative wheels on the nose stint
2226		
2227		
2228		
2229		
2230		

End of Transcript

* This portion of the rerecording is not entirely clear, but this represents the best interpretation possible under the circumstances.

BNA-ATCT-079
VJA558

PERSONNEL STATEMENTS

FEDERAL AVIATION ADMINISTRATION
NASHVILLE ATCT

January 7, 1996

The following is a report concerning the accident involving VJA558 at the Nashville Airport, January 7, 1996 at 2227 UTC.

My name is Robert F. Snuck (SK). I am employed as an Air Traffic Control Specialist by the Federal Aviation Administration at the Nashville Air Traffic Control Tower, Nashville, Tennessee.

During the period 2000 UTC to 0500 UTC, January 7, 1996, I was on duty in the Nashville, TN ATCT. I was working the Departure Radar West position, from 2038 UTC to 2211 UTC.

While working the Departure Radar West position, VJA558 checked-in at one two thousand. VJA558 was turned to a two hundred eighty degree heading and descended to 5,000 feet and told to expect vectors for the ILS approach runway 2R. All arrival were to go to runway 2R for snow removal on runway 31 per watch supervisor, unless otherwise coordinated. The two hundred eighty degree heading was issued to vector VJA 558 away from EGF533. EGF533 was turned to a one hundred twenty degree heading. When these aircraft were not a factor for each other, VJA558 was turned to a three hundred ten degree heading and EGF533 was turned direct Rome Vortac. I was relieved on the position by Pat Brown.

Robert F. Snuck

BNA-ATCT-079
VJA558

PERSONNEL STATEMENTS

FEDERAL AVIATION ADMINISTRATION
NASHVILLE ATCT

January 7, 1996

The following is a report concerning the accident involving VJA558 at the Nashville Airport, January 7, 1996 at 2227 UTC.

My name is Patrick E. Brown (BR). I am employed as an Air Traffic Control Specialist by the Federal Aviation Administration at the Nashville Air Traffic Control Tower, Nashville, Tennessee.

During the period 1830 UTC to 0330 UTC, January 7, 1996, I was on duty in the Nashville, TN ATCT. I was working the Departure Radar West position, from 2212 UTC to 2241 UTC.

I assumed Departure Radar West at 22122. All radar positions were combined to Departure Radar West at this time. VJA558, DC9, was twenty-five miles southeast of the Nashville Airport. I issued information for landing runway 2R At fifteen southeast, I turned the aircraft to heading three four zero for vectors to the final approach. At approximately 22152, I cleared VJA558 for the ILS approach to runway 2R At 22162, I instructed VJA558 to contact the tower. At approximately 22232, I saw VJA558's radar tag appear northeast bound off of runway 2R I called Local Control One to see if the DC9 had a go-around. Local Control One told me to standby because there was a problem. VJA558 made a right turn southeast bound at one thousand two hundred feet. Local Control One called back to report runway 2R closed due to debris on the runway. I then observed VJA558 turning to a straight-into runway31, with no radio contact with Departure radar West. VJA558's radar tag went into coast track.

I reserve the right to make any changes to this document if further information is available.

Patrick E. Brown

BNA-ATCT-079
VJA558

PERSONNEL STATEMENTS

FEDERAL AVIATION ADMINISTRATION
NASHVILLE ATCT

January 7, 1996

The following is a report concerning the accident involving VJA558 at the Nashville Airport, January 7, 1996 at 2227 UTC.

My name is Douglas A. Geary (DG). I am employed as an Air Traffic Control Specialist by the Federal Aviation Administration at the Nashville Air Traffic Control Tower, Nashville, Tennessee.

During the period 1830 UTC to 0330 UTC, January 7, 1996, I was on duty in the Nashville, TN ATCT, I was working the Local Control One position, from 2131 UTC to 2234 UTC.

VJA558 reported on my frequency on an 8-mile final, ILS approach to Runway 2R. I cleared him to land on initial contact. On a two-mile final, I relayed a braking action report from the preceding arrival. The crew of VJA558 acknowledged the report and then asked something that I didn't understand. I had him repeat the question, but again I didn't understand, so he told me to disregard. When the aircraft was about 400 feet short of the threshold, I observed the aircraft sink in an increasing nose-up/taildown attitude and impact the ground with the tail about two hundred and fifty feet short of the runway. The nose of the aircraft then impacted the ground, and I observed the two nose-wheels and other debris sliding down the runway. The aircraft commenced a go-around and there was a brief discharge of white vapor from an engine. As VJA558 climbed straight-out, I attempted to inform him of the observed damaged to the nose gear, but there was no response. I eventually lost sight of the aircraft

About three miles north-northeast of the airport, I observed the aircraft, on the BRITE, make a descending right turn. During the next 5 minutes, I made several attempts on both tower frequencies and Emergency frequency, 121.5, to inform the aircraft of the nose-gear damage. The crew never responded,

however, they did squawk seven-six-zero-zero about three miles northeast of the airport. The aircraft continued the right turn back to the airport and I again got the aircraft in sight about two miles east of the airport as he turned right-based to final for runway 31. I was still relaying damage reports to the crew, but they continued the approach. The aircraft landed on Runway 31 and slid to rest on the nose strut about 400 feet northwest of runway 2L.

Douglas A. Geary
Douglas A. Geary

BNA-ATCT-079
VJA558

PERSONNEL STATEMENTS

FEDERAL AVIATION ADMINISTRATION
NASHVILLE ATCT

January 7, 1996

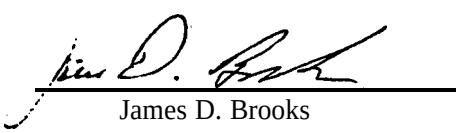
The following is a report concerning the accident involving VJA558 at the Nashville Airport, January 7, 1996 at 2227 UTC.

My name is James D. Brooks (DW). I am employed as a Supervisory Air Traffic Control Specialist by the Federal Aviation Administration at the Nashville Air Traffic Control Tower, Nashville, Tennessee.

During the period 1830 UTC to 0330 UTC, January 7, 1996, I was on duty in the Nashville, TN ATCT. I was working the Cab Supervisor position from 1900 UTC to 0217 UTC.

I was about to take my dinner break when someone in the tower shouted "Look at Critter". When I looked up, I saw VJA558 in a nose-high attitude as the tail of the aircraft hit the ground short of the runway 2R threshold. The nose then impacted the runway with what appeared as tremendous force and debris from the nose commenced to falling off as the aircraft commenced a go-around. I called the fire station giving them an Alert II on VJA558, DC9, who lost two wheels and no further information available.

The aircraft made a right turn northeast of the airport, then turned toward runway 31, while squawking seven-six-zero-zero. I took the light gun and tried flashing red to the aircraft with no response. The aircraft landed on runway 31 sliding down the runway on the nose strut until it came to rest.



James D. Brooks

BNA-ATCT-079
VJA558

PERSONNEL STATEMENTS

FEDERAL AVIATION ADMINISTRATION
NASHVILLE ATCT

January 7, 1996

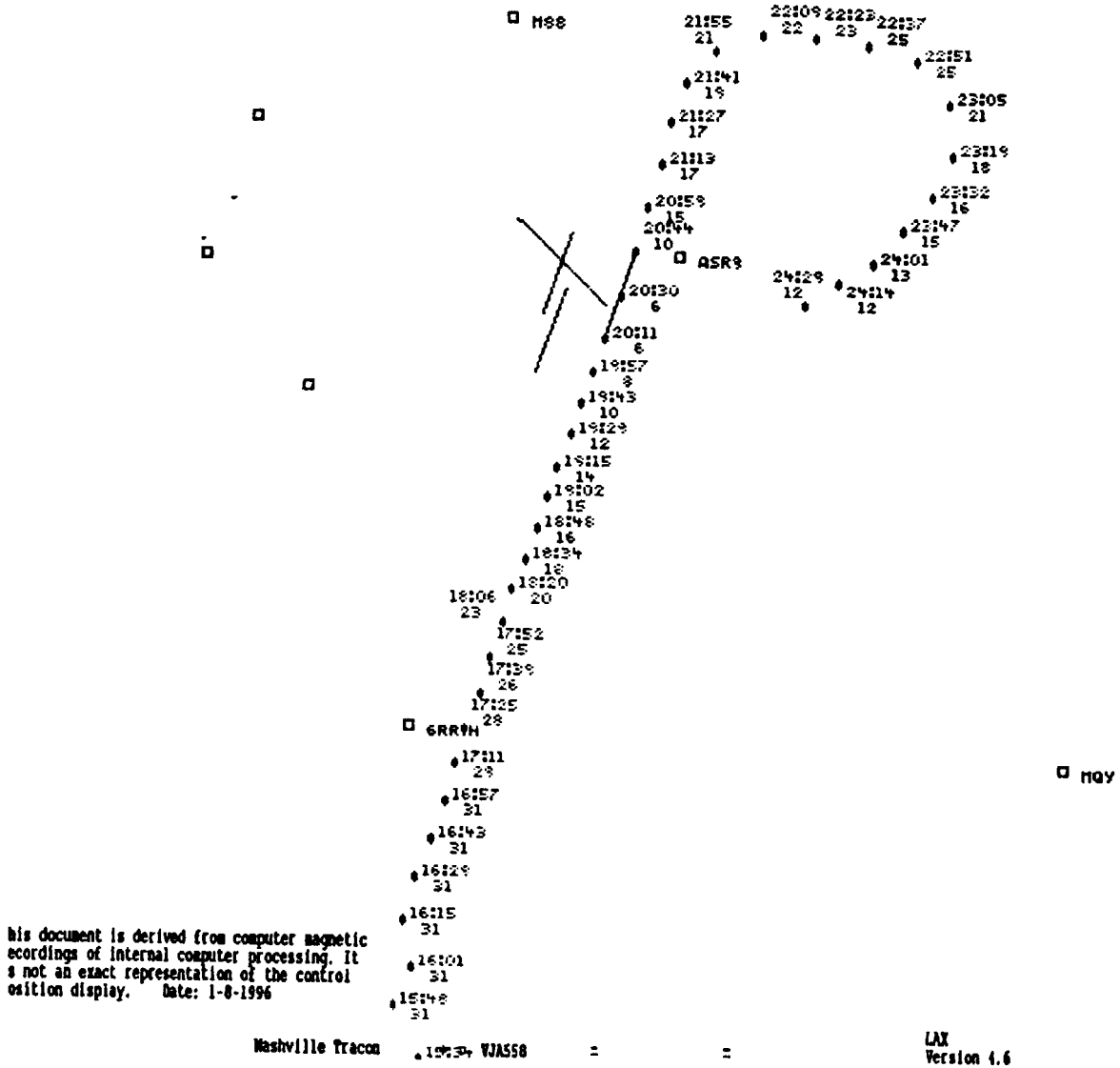
The following is a report concerning the accident involving VJA558 at the Nashville Airport, January 7, 1996 at 2227 UTC.

My name is John M. Cowan (MC). I am employed as a Supervisory Air Traffic Control Specialist by the Federal Aviation Administration at the Nashville Air Traffic Control Tower, Nashville, Tennessee.

During the period 1800 UTC to 0230 UTC, January 7, 1996, I was on duty in the Nashville, TN ATCT. I was working as the TRACON Supervisor, from 1841 UTC to 0221 UTC.

At approximately 2221Z, I was advised by the tower cab supervisor that VJA558 had sustained damage during an attempted landing on runway 2R and had departed. I then proceeded to the closest radar scope and observed VJA558 approximately 4 miles northeast of the Nashville Airport. VJA558 circled to land runway 31.

John M. Cowan



his document is derived from computer magnetic ecordings of internal computer processing. It s not an exact representation of the control osition display. Date: 1-8-1996

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
REPORT OF AIRCRAFT ACCIDENT

REPORT NO: BNA-ATCT-079

February 5, 1996

Nashville ATC Tower

January 7, 1996

ALL TIMES BELOW ARE COORDINATED UNIVERSAL TIME
UNLESS OTHERWISE SPECIFIED

2140 - VJA558 departs Atlanta Hartsfield Airport and establishes initial radio contact with Atlanta Departure Radar North. Atlanta establishes radar contact.

2142 - Atlanta Departure clears VJA558 to climb to 14,000. Pilot acknowledges clearance.

2144 - VJA558 handed off to Atlanta ARTCC on frequency 133.1.

2144 - VJA558 on initial contact was assigned FL230.

2148 - R38 cleared VJA558 direct to Choo Choo VORTAC (CQO) to resume own navigation. VJA558 was then switched to Atlanta Center frequency 126.67.

2149 - On initial contact on frequency 126.67 VJA558 was assigned FL240.

2152 - R37 asked VJA558 if he was going direct CQO and the pilot replied in the affirmative.

2155 - VJA558 was handed off and switched to Memphis ARTCC frequency 126.75.

2155 - VJA558 reported on R40's frequency at FL240.

2158 - R40 cleared VJA558 to cross Volls intersection at 10,000 feet and issued the Nashville altimeter. VJA558 acknowledged.

2201 - R40 amended VJA558's altitude to 12,000 feet for traffic. VJA558 acknowledged.

2205 - R40 initiated a radar handoff and transferred communication to Nashville Approach Control on 127.17.

2206 - VJA558 reported on frequency with Departurre Radar West (DRW) at 12,000 feet. DRW then instructed VJA558 to turn left heading of 280 degrees, descend and maintain 5,000 feet, and to expect the ILS Runway 2 right approach.

2211 - VJA558 was instructed to descend to 3,000 feet.

2213 - VJA558 was instructed to turn 10 degrees right, then the instruction was changed to 340 degrees.

2214 - VJA558 was asked his airspeed and then was cleared for the approach.

2215 - VJA558 was issued traffic inbound for Runway 31 and then was switched to the tower.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
REPORT OF AIRCRAFT ACCIDENT

February 5, 1996 . BNA-ATCT-079

Nashville ATC Tower

2217 - VJA558 reported on frequency with Local Control One (LC1) and was cleared to land.

2219 - VJA558 was issued braking action reports and attempted to engage LC1 in conversation.

2220 - VJA558 attempted to land Runway 2 right, rotated, and lost the nose wheels. LC1 advised VJA558 of his nose wheel status and received no reply.

2221 - DRW communicated with LC1 to determine the status of VJA558 and a course of action for the other aircraft inbound. DRW was instructed to remain clear of VJA558. LC1 also attempted to re-establish two way communication with VJA558.

2222 - LC1 attempts to communicate with VJA558 again.

2223 - DRW communicated with LC1 and determined that communications had not been re-established with VJA558. LC1 instructed DRW to watch VJA558. LC1 attempts to communicate with VJA558 again.

2225 - LC1 transmitted to VJA558 that he was missing the nose wheels.

Item 7 of FAA Form 8020-6:
Passenger Names and Addresses Unknown.

NO MORE FOLLOWS

APPENDIX E - EXCERPTS FROM VALUJET AND DOUGLAS DOCUMENTS/MANUALS

FlightSafety
international

DC-9 TRAINING *SYLLABUS*
Initial Equipment Training

VALUJET AIRLINES

SYLLABUS

TIME	SUBJECT	INSTRUCTOR
	GROUND TRAINING DAY 1 Basic Indoctrination	
0800-1200	Operator Specific Subjects	
1200-1300	LUNCH	
1300-1700	Operator Specific Subjects	
	GROUND TRAINING DAY 2	
0800-1200	Operator Specific Subjects	
1200-1300	LUNCH	
1300-1700	Operator Specific Subjects	
	GROUND TRAINING DAY 3	
0800-1200	Operator Specific Subjects	
1200-1300	LUNCH	
1300-1700	Operator Specific Subjects	
	GROUND TRAINING DAY 4	
0800-1200	Airman Specific Subjects	
1200-1300	LUNCH	
1300-1700	Airman Specific Subjects	

FlightSafety international

DC-9 TRAINING
Initial Equipment Training

SYLLABUS

VALUJET AIRLINES

TIME	SUBJECT	INSTRUCTOR
	GROUND TRAINING DAY 5	
0800-1200	Airman Specific Subjects	
1200-1300	LUNCH	
1300-1700	Airman Specific Subjects	
	GROUND TRAINING DAY 6 General Emergency	
0800-1200	Emergency Equipment and Drills	
1200-1300	LUNCH	
1300-1700	Emergency Equipment snd Drills	
	GROUND TRAINING DAY 7 Aircraft Systems	
0800-1200	Aircraft Description	
1200-1300	LUNCH	
1300-1500	Aircraft Description	
1500-1700	APU	

FlightSafety International

DC-9 TRAINING
Initial Equipment Training

SYLLABUS

VALUJET AIRLINES

TIME	SUBJECT	INSTRUCTOR
	GROUND TRAINING DAY 8	
0800-1100	Fuel System	
1100-1200	Fire Protection System	
1200-1300	LUNCH	
1300-1700	Powerplant	
	GROUND TRAINING DAY 9	
0s00-1200	Electrical System	
1200-1300	LUNCH	
1300-1500	Electrical System	
1500-1700	Hydraulics	
	GROUND TRAINING DAY 10	
0800-0930	Landing Gear	
0930-1200	Brakes	
1200-1300	LUNCH	
1300-1700	Flight Controls	

FlightSafety
international

DC-9 TRAINING
Initial Equipment Training

SYLLABUS

VALUJET AIRLINES

TIME	SUBJECT	INSTRUCTOR
	GROUND TRAINING DAY 11	
0800-1100	Heating & Cooling	
1100-1200	Pressurization System	
1200-1300	LUNCH	
1300-1500	Pressurization System	
1500-1700	Ice & Rain Protection System	
	GROUND TRAINING DAY 12	
0800-0930	Oxygen System	
0930-1200	Emergency Equipment	
1200-1300	LUNCH	
1300-1500	Communications	
1500-1700	Instruments	
	GROUND TRAINING DAY 13	
0800-1200	Navigation	
1200-1300	LUNCH	
1300-1700	Automatic Flight	

VALUJET AIRLINES

TIME	SUBJECT	INSTRUCTOR
	GROUND TRAINING DAY 14 System Integration	
0600-0700	Briefing	
0700-1115	Fixed-Base Simulator	
1115-1200	MEAL	
1200-1300	Post-Briefing/Review	
1300-1500	Performance	
	GROUND TRAINING DAY 15	
0600-0700	Briefing	
0700-1115	Fixed-Base Simulator	
1115-1200	MEAL	
1200-1300	Post-Briefing/Review	
1300-1500	Performance	
	GROUND TRAINING DAY 16	
0600-0700	Briefing	
0700-1115	Fixed-Base Simulator	
1115-1200	MEAL	
1200-1300	Post-Briefing/Review	
1300-1500	Performance	

FlightSafety international

DC-9 TRAINING
Initial Equipment Training

SYLLABUS

VALUJET AIRLINES

TIME	SUBJECT	INSTRUCTOR

GROUND TRAINING DAY 17

Equipment Examination (Oral)

FlightSafety International

DC-9 TRAINING
Initial Equipment Training

SYLLABUS

VALUJET AIRLINES

TIME	SUBJECT	INSTRUCTOR
	FLIGHT TRAINING DAY 1	
0600-0700	Briefing	
0700-1115	FulI-Flight Simulator	
1115-1215	Post-Briefing/Review	
	FLIGHT TRAINING DAY 2	
0600-0700	Briefing	
0700-1115	Full-Flight Simulator	
1115-1215	Post-Briefing/Review	
	FLIGHT TRAINING DAY 3	
0600-0700	Briefing	
0700-1115	Full-Flight Simulator	
1115-1215	Post-Briefing/Review	
	FLIGHT TRAINING DAY 4	
0300-0700	Briefing	
	Full-Flight Simulator	
1115-1215	Post-Briefing/Review	

FlightSafety
international

DC-9 TRAINING
Initial Equipment Training
SYLLABUS

VALUJET AIRLINES

TIME	SUBJECT	INSTRUCTOR
	FLIGHT TRAINING DAY 5	
0600-0700	Briefing	
0700-1115	Full-Flight Simulator	
1115-1215	Post-Briefing/Review	
	FLIGHT TRAINING DAY 6	
0600-0700	Briefing	
0700-1115	Full-Flight Simulator	
1115-1215	Post-Briefing/Review	
	FLIGHT TRAINING EVALUATION	
0600-0700	Briefing	
0700-1115	Full-Flight Simulator	
1115-1215	Post-Briefing/Review	

VALUJET AIRLINES

LESSON NAME:
Landing Gear

TIME:
1.5 Hours

LESSON OBJECTIVES:

With the use of the DC-9 Pilot Manual, checklists, transparencies, cockpit systems simulator, appropriate handouts, and class notes, the pilot will be able to:

1. Locate, identify, and state the function of all panels, controls, switches, lights, and indicators involving landing gear, and state their proper use.
2. State procedure for preflighting landing gear system.
3. Knowledgeably discuss all landing gear system limitations.
4. Knowledgeably discuss normal procedures for proper management of landing gear system for all phases of operation.
5. Knowledgeably discuss and locate all systems-related emergency/abnormal checklist procedures.

VALUJET AIRLINES

LESSON ELEMENTS:

I. Aircraft Systems Modules
  A. Landing Gear Module
    1. General Description
      a. Mechanically-actuated hydraulically -operated tricycle gear
        (1) Number and size of tires, speed rating, inflation pressure, etc
      b. Landing gear controls and hydraulic pressure sources
        (1) Hydraulic systems interaction in all modes **of** gear operation
        (2) Gear handle
        (3) Gear handle release button (handle override)
        (4) Emergency gear extension lever
          (a) Free-fall capability
      c. How locked down and how held up
      d. Gear doors
        (1) Normal operation, main and nose gear doors
        (2) Procedure for opening on ground
        (3) Open main gear doors will drag ground
      e. Spray deflectors on main gear; spray deflector or chine tires on nose gear
      f. Tail bumper assembly

    2. Nosewheel Steering
      a. Controlled by steering wheel (±80 degrees) or redder pedals (±15 degrees)
      b. Two hydraulic steering cylinders
        (1) One pressurized by each hydraulic system
        (2) One alone can provide nose gear steering at slight steering angle loss
        (3) Shimmy dampers in neutral position
      c. Manually operated bypass for towing

    3. Ground shift mechanism
      a. Location and purpose
      b. Functions
        1) Left ground control switch
        2) Right ground control switch
      c. Ramifications of override

4. Operating Limitations
   a. Cover all limitations, including gear extension/retraction speeds
   b. Discuss landing with main gear doors open

5. Controls and Indicators
   a. Include emergency gear extension lever, main gear visual position viewer, and nose gear visual lock indicator

6. Normal Procedures
   a. Discuss all landing gear-related normal procedures

7. Emergency /Abnormal Procedures
   a. In-depth coverage of all landing gear-related emergency/abnormal procedures

VALUJET AIRLINES

EQUIPMENT.

1. Overhead projector
2. White or black board
3. DC-9 Pilot Manual
4. Cockpit procedures trainer
5. Checklist

INSTRUCTOR ACTIONS:

1. Introduce the lesson and state the lesson objectives.
2. Overview the lesson elements and provide motivation.
3. Present the lesson.
4. Conclude the presentation with a review of the lesson objectives by asking oral questions.

STUDENT ACTIONS:

1. Listen, take notes, and ask questions.
2. Answer oral questions
3. Operator systems in CPT when required.

COMPLETION STANDARDS

The pilot must demonstrate adequate knowledge of the DC-9 aircraft systems, limitations, and performance by satisfactorily completing an Equipment Examination (Oral) normally administered at the end of the Ground Training Curriculum Segment. The Equipment Examination is administered by either the FAA or a Check Airman, as required.

VALUJET AIRLINES

SYSTEM INTEGRATION PERIOD #3

DURATION:
Briefing: 20
cm: 4:0
Debrief: 2:0

BRIEFING:

1. Brief the objectives and the completion standards.
2. Brief initial conditions, aircraft status and load, and departure and arrival airport weather.
3. Brief each procedure and maneuver that is to be accomplished in the lesson. Emphasize the checklist and procedures to be used.
4. Brief performance data computation.
5. Brief abnormal/emergency procedures for hydraulics, landing gear and brakes, flight controls, and pressurization systems.

OBJECTIVES:

With the use of the aircraft checklist, weight & balance data, performance data card. performance and planning manual, takeoff weights manual and the CPT, the crewmember will be able to practice and demonstrate the following:

1. Accomplish all checklist and flow patterns in a proficient manner.
2. Abnormal/emergency procedures for systems covered in briefing.
3. As appropriate, abnormals and emergency procedures previously covered.
4. State all emergency procedure recall items.

VALUJET AIRLINES

SYSTEM INTEGRATION PERIOD #3

Cockpit Preflight Events:

1. As previously covered.

Engine Start and Taxi Events:

1. Abnormal start procedures not previously practiced.
2. Hydraulic and electrical system abnormals.

Takeoff Events:

L As previously covered.
2. Engine failure on takeoff.
3. Landing gear retraction abnormals.

Climb Events:

1. Normal procedures
2. Hydraulic, landing gear, and flight control systems abnormals.

Cruise Events

1. Engine and electrical system abnormals not previously practiced.
2. Hydraulic and flight control system abnormals.
3. Pressurization system abnormals.

Descent Events:

1. Normal pressurization.
2. Landing data, including abnormal conditions.
3. Descent checklist and procedures.

Approach and Landing Events:

1. Approach checklist and procedures.
2. Gear extension abnormals.
3. Before landing-final checklist.
4. Required callouts.

After Landing Events:

L After landing checklist.
2. Parking checklist and procedures.
3. Terminating checklist and procedures.

VALUJET AIRLINES

SYSTEM INTEGRATION PERIOD #3

EQUIPMENT

1. Cockpit Systems Training Device
2. White or Blackboard & chalk
3. Checklist and Performance Data Cards
4. Weight & Balance Template and Forms
5. Performance & PIanning Manual or Data
6. Takeoff and Landing Weights Manuals or Data as appropriate.

INSTRUCTOR ACTIONS:

1. Introduce the lesson and state the lesson objectives.
2 Overview the lesson elements and provide motivation.
3. Provide assistance as required to help crewmember integrate the system training with procedures.

STUDENT ACTIONS:

1. Complete all Weight & Balance and performance problems.
2. practice all procedures and checklist responses.
3. Commit to memory all required recall items.
4. Take notes and ask questions.

COMPLETION STANDARDS:

The pilot must demonstrate adequate knowledge of the DC-9 systems; the ability to perform normal procedures within the required limitations; and familiarity with all checklist procedures and proper responses by satisfactorily completing an Equipment Examination (Oral) normally administered at the end of the Ground Training Curriculum Segment. The Equipment Examination is administered by either the FAA or a Check Airman, as required.

UNABLE TO RAISE GEAR LEVER

NOTE

Indicates possible malfunction of ground shift.

NOSE STEERING WHEEL.....OPERATE (C)
- Attempt to turn nose steering wheel using normal force.

If steering wheel does NOT turn and centering indices are aligned:

Indicates a malfunction of the anti–retraction mechanism.

If desired, retract landing gear:

GEAR HANDLE RELEASE BUTTON.....PUSH (PNF)
- **Bypasses anti-retraction mechanism.**

GEAR LEVER.....UP (PNF)
- **Press release button and place lever UP to retract the gear.**

If steering wheel turns:

DO NOT RETRACT THE GEAR

Indicates ground shift mechanism is still in the ground mode.

No auto-presaurization, and takeoff warning horn will sound when flaps/slats are retracted.

The ground control relay electrical circuits can be placed in the flight mode by pulling the Ground Control

Approach and landing:

If landing gear was not retracted prior to landing, ground spoilers must be operated manually.

AIRPLANE.....REPRESSURIZE (PNF)
- **Ensure airplane is repressurized prior to landing.**

ANTI-SKID SWITCH (before 30kits).....OFF (PNF)
- **During landing rollout and prior to 30 kts, momentarily release brakes and place Anti-skid switch to OFF.**

GROUND CONTROL RELAY C/Bs (if pulled)
(H2O and J20).....RESET (C or FO)
- **Reset Ground Control Relay circuit breakers during taxi and verify that circuits are in the ground mode.**

UNABLE TO RAISE GEAR LEVER

NOSE STEERING WHEEL ..... OPERATE (c)

If steering wheel does NOT turn and centering indices are aligned:

Indicates a malfunction of the anti-retraction mechanism.

If desired, retract landing gear:

GEAR HANDLE RELEASE BUTTON ..... PUSH (PNF)

GEAR LEVER.....UP (PNF)

If steering wheel turns:

DO NOT RETRACT THE GEAR

Indicates ground shift mechanism is still in the ground mode.

No auto-pressurization, and takeoff warning horn will sound when flaps/slats are retracted.

The ground control relay electrical circuits can be placed in the flight mode by pulling the Ground Control Relay circuit breakers (H20 and J20).

Do not exceed VLE (300 kts/M.70).

Approach and landing:

If landing gear was not retracted prior to landing, ground spoilers must be operated manually.

AIRPLANE.....DEPRESSURIZE (PNF)

ANTI-SKID SWITCH (before 30 kts).....OFF (PNF)

GROUND CONTROL RELAY C/Bs (if pulled)
(H20 and J20).....RESET (C or FO)

pilot, he/she shall declare an emergency and take any action that he/she considers necessary under the circumstances.

3. Whenever a pilot-in-comnand or dispatcher exercises emergency authority, he/she shall keep the appropriate ATC facility and System Operations Control fully informed of the progress of the flight. The person declaring the emergency shall send a written report of any deviation, through Flight Operations, to the Administrator. A dispatcher shall send his/her report within 10 days after the date of the emergency, and a pilot-in-command shall send his/her report within 10 days after returning to his/her home base.

4. Regulations do not intend that a situation or condition must become critical before emergency authority is exercised. The Captain will make an evaluation of the factors and information available to him, and if he/she then believes an emergency exists or will be created, will take the action he/she deems necessary. ValuJet System Operations Control Is responsible to provide advice and information to assist the Captain during the emergency; however, the Captain's decision is final.

D. **Reporting**

1. The Captain shall report all incidents and/or irregularities to System Operations Control by radio or telephone at the earliest opportunity.

2. In addition to the above, the Captain must notify the Chief Pilot and/or Vice President - Flight Operations by telephone or teletype immediately after landing and submit a written report immediately upon his/her return to home base.

E. **Emergency Conditions**

The following should be considered emergency conditions:

1. Indication of fire on board the airplane.

2. Failure or malfunction of aircraft or any component which interferes with the continued safe operation.

3. Priority handling requested of ATC by the P.I.C.

4. Inability to establish definite position.

5. Flight more than twenty minutes overdue and not heard from at terminal, intermediate station, or other check point.

3.3 CREW MEMBER RESPONSIBILITIES

A. Flying From the Left Seat

Except as may be authorized by the Chief Pilot, all flight officers will perform their duties from their normal seats. Designated Check Airmen are authorized to occupy a pilot seat in conjunction with required initial or annual enroute checks.

B. First Officer Flying

1. A captain who has at least 100 hours as P.I.C. in jet transport aircraft under Part 121 may, at his/her discretion, allow the First Officer to manipulate the flight controls for takeoffs, approaches and landings as well as enroute phases of flight.

2. A First Officer who has not met the 100 hour minimum requirement shall not be paired with a Captain who also has not met the requirement.

3. Before take-off, the Captain shall satisfy himself/herself that the First Officer (and AC if applicable) clearly understands the duties he/she is to perform. Also, the Captain should also ensure that the First Officer fully understands the procedures to be flown for both take-off and landing.

C. Succession of Command

Should any crewmember become incapacitated and unable to perform his/her prescribed function, the sequence of command shall be as follows:

1. Captain
2. First Officer
3. Position One Flight Attendant
4. Flight Attendants, in order of seniority.

Should the Captain become incapacitated, the First Officer should remain in the right seat for landing.

D. Crew Resource Management

In today's cockpit environment, the technical skills that Flight Crewmembers possess to fly an aircraft from point A to point B need to be supplemented with "Human Factors" skills. Crews must effectively utilize all the resources available, that includes other Crew members.

CRM is the blend of technical and human skills required to support the safe and efficient operation of our aircraft.

VALUJET
PILOT READ FILE

BULLETIN # 148
January 8, 1996

To: All Pilots

From: Director Flight Standards and Training$_{PD}$

Re: QRH

If it becomes necessary to refer to the QRH(Quick Reference Handbook), for Emergency or Abnormals procedures, Please use the appropriate section of the AOM(Aircraft Operating Manual) in conjunction. with the QRH.

The above procedures will remain in effect until further notice.

TECH. PUBS. VALUJET Fax:770-907-5035 Jul 25 '96 13:50 P. 02

VALUJET
PILOT READ FILE

BULLETIN # 153
February 22,1996

To: All Pilots

From: Director Flight Standards and Training

Re: First Officer Minimums/ QRH removal from aircraft

Effective immediately, First Officer minimums will be 300' AGL and 3/4 miles visibility. Additionally, the First Officer minimums in the first 100 hours will be 500' AGL and 1 ½ miles visibility.

In the next few days, all of the aircraft should have the new Emergency Check list on board. If you should encounter a aircraft with the QRH on board, please give this office a call at 770-907-5421 and let us know. In this case, remember that the QRH is to be used for reference only and the Aircraft Operating Manual will have updated information. Maintenance in ATL and IAD Emergency Cheek List on hand.

(c) If ice was found on the wing upper surface, recheck the wing by using suitable means after deicing/anti-icing, to ensure that all deposits of ice have been removed.

CAUTION: IN SOME CASES PRESENCE OF ICE CAN ONLY BE DETERMINED BY TOUCH.

(d) Fuselage areas in front of the cockpit windows must be free of snow and ice. This is also-valid for all air inlet and outlet openings of the APU and air-conditioning as well as their adjacent areas.

(2) Functional test of flight controls.

(a) Should an aircraft have an extreme ice or snow cover, a flight control check should be considered according to the type of aircraft. This check should be performed after deicing.

(3) Check of engine inlets, probes, and fan blades.

(a) Engines that have been subjected to strong snowfall and/or freezing rain during freezing temperatures and strong winds have to be checked for possible accumulation of snow and/or ice in the inlet area prior to startup.

(b) Under freezing fog conditions a check of the rearside of the fan blades for ice build-up is recommended.

(c) In case of fan blade icing, hot air shall be used to melt the ice.

12. Additional Cold Weather Servicing Requirements

A. Nose Gear Strut

(1) Prior to cold weather season:

(a) Change fluid in strut. This prevents seal damage caused by water in fluid which changes to ice particles during cold weather exposure.

(b) Replace seals as required.

(2) During cold season:

(a) Check strut for servicing requirements every 14 days.

(b) Wipe exposed chromed surface of piston with MIL-H-5606 hydraulic oil daily.

B. Water and Lavatory Servicing

(1) When cabin is heated after a prolonged cold soak, plumbing below floor level can be considerably colder, and lines may freeze when water is added. To prevent this, do not service systems until the cabin has reached 70°F (21°C) and area below floor has been checked to ensure that warm air has been circulated. In general,with an outside temperature of 32°F (O°C) a minimum of two hours heating the cabin at 70°F (21°C) will be required to ensure the below-floor plumbing will not freeze.

(2) If aircraft has been parked in freezing temperatures for two hours or longer between flights, maintain heat on aircraft, and leave lavatory doors open and toilet seats raised to allow a more even distribution of cabin temperature.

C. Towing Operations - These precautions should be taken to prevent deflation of nose gear strut and tires:

(1) All pushouts and towing operations need to be performed smoothly. A jerky start will place enough force on nose gear to cause strut to start leaking.

(2) Sharp turns are to be avoided, since too much weight will be placed on outside tire, and could cause seal between tire and rim to break with subsequent tire leakage.

(3) After snow removal, a frozen ridge may remain next to tire. Unless aircraft is pushed straight back, tire may contact ridge. This also could cause tire and rim seal to break with subsequent loss of tire pressure.

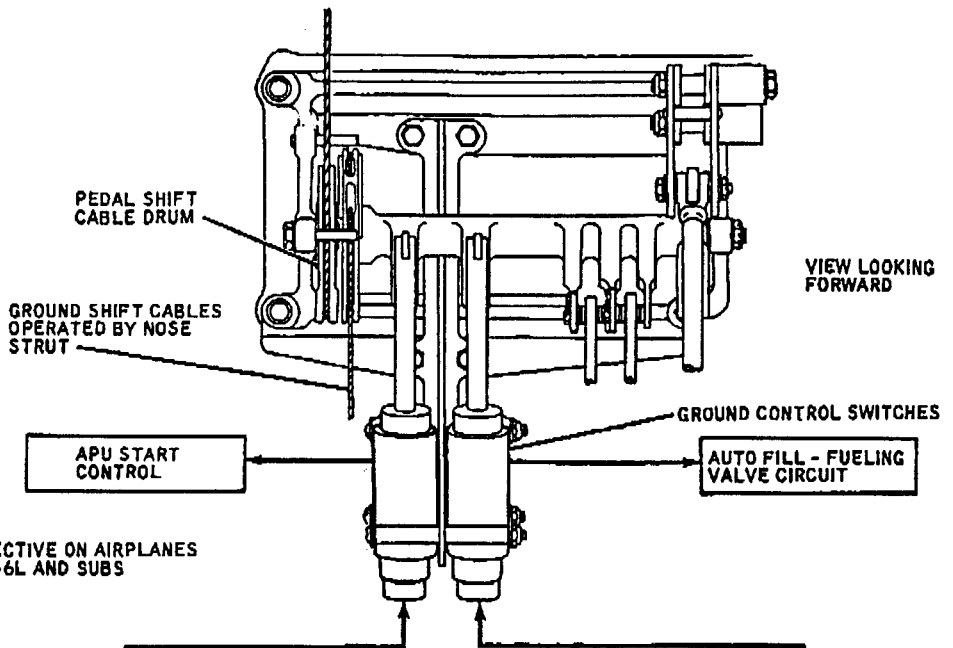
D. Batteries - Maintain an external electrical power supply on aircraft to keep batteries charged. If this is not practical, make certain that an external power supply is connected to aircraft to at least three hours prior to using battery (such as, an APU start). Failure to do so may shorten battery life.

E. Doors - Perform the following prior to start of cold weather season:

(1) Check all door linkages, hinges, etc., for wear and alignment.

(2) Check doors for proper gap between door skin and doorjamb. Failure to do so may result in difficulties in opening doors, especially during cold weather operations where a reduced gap may increase incidence of water freezing between door skin and doorjamb.

LANDING GEAR -- GROUND SHIFT MECHANISM FUNCTIONS



NOTE: GROUND CONTROL RELAYS CONTROL GROUND OR FLIGHT MODE OF OPERATION.

THE FOLLOWING LISTS MAY CONTAIN PROVISIONS FOR FUTURE INSTALLATIONS.

LEFT GROUND CONTROL RELAY

- STALL WARNING
- RADIO RACK VENTING
- APU AC CROSSTIE CIRCUIT
- AIRFOIL ICE PROTECTION
- AIRFOIL ICE PROTECTION INDICATION
- HEAT EXCHANGER COOLING FAN
- SPOILER CONTROL
- ANTI-SKID CONTROL
- THRUST REVERSER ISOLATION SOLENOID VALVE
- AIR CONDITIONING PNEUMATIC SUPPLY CONTROL
- PASSENGER ADDRESS CONTROL AND OUTPUT
- CABIN PRESSURE CONTROL
- TAKEOFF WARNING SYSTEM
- RAT PROBE HEATER
- SPEED COMMAND NO. 1
- TURBINE SPLIT NOZZLE CONTROL
- AIR CONDITIONING PURGE
- *CARGO COMPARTMENT HEATER

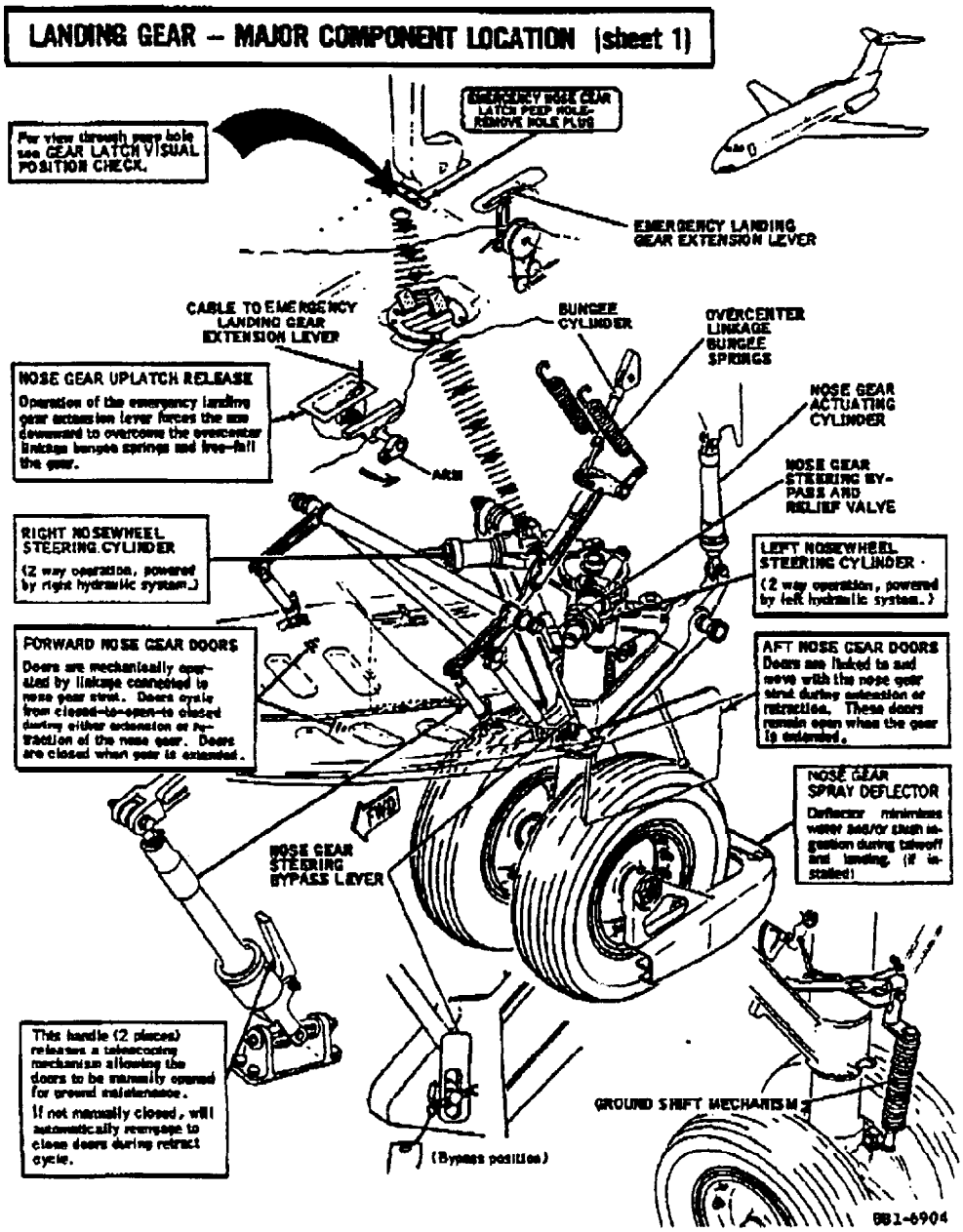
LEFT GROUND CONTROL CIRCUIT BREAKER

RIGHT GROUND CONTROL RELAY

- STALL WARNING
- RADIO RACK VENTING
- APU AC CROSSTIE CIRCUIT
- AIRFOIL ICE PROTECTION
- AIRFOIL ICE PROTECTION INDICATION
- HEAT EXCHANGER COOLING FAN
- SPOILER CONTROL
- ANTI-SKID CONTROL
- THRUST REVERSER ISOLATION SOLENOID VALVE
- AIR CONDITIONING PNEUMATIC SUPPLY CONTROL
- COCKPIT VOICE RECORDER
- GALLEY CONTROL
- TURBINE SPLIT NOZZLE CONTROL
- AIR CONDITIONING PURGE
- * CABIN PRESSURE CONTROL

RIGHT GROUND CONTROL CIRCUIT BREAKER

LANDING GEAR – MAJOR COMPONENT LOCATION (sheet 1)



Printed in U.S.A.

LANDING GEAR -- ABNORMAL OPERATION

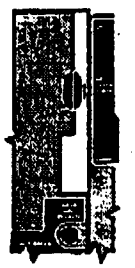
CONDITION
UNABLE TO RAISE LANDING GEAR CONTROL HANDLE AFTER TAKEOFF.

ACTION

1. Check nosewheel steering with NORMAL force on wheel.
2. If wheel does not turn and index (if installed) is centered, a malfunction of the gear anti retract mechanism is indicated. In this event push the gear handle release button and raise the landing gear handle. Go to step 4.
3. DO NOT RETRACT landing gear if wheel is steerable as there is no assurance that the nosewheel will center, and remain centered, during retraction. Limit speed to applicable gear extend limitations. Continue procedure.
4. If electrical circuits (auto pressurization, takeoff warning after flaps up) indicate that ground shift is in ground mode, pull ground control relay circuit breakers to place circuits in flight mode. Insure that airplane is depressurized prior to landing.
5. On next landing, during rollout (above approximately 90 kts.) momentarily release brakes and place the anti-skid switch to OFF and operate brakes manually.

   NOTE: IF GEAR HAS NOT BEEN RETRACTED PRIOR TO LANDING, GROUND SPOILERS MUST BE OPERATED MANUALLY.
6. Reset ground control relay circuit breakers during taxi and verify that electrical circuits (auto pressurization, air conditioning, ground blowers) are in the ground mode.

CONDITION
UNSATISFACTORY UPLATCH CHECK (INDICATED BY RED LIGHT ON WHEN GEAR HANDLE IS PLACED IN UP-LATCH POSITION).



ACTION

1. Return lever to UP position. Limit speed to 300 Kts. (Mach 0.7) or below.
2. Decelerate aircraft to 250 Kts maximum and recycle the landing gear.
3. Repeat uplatch check.
4. If uplatch check is again unsatisfactory:
   a. Return or,
   b. The flight may continue provided the landing gear extension speed of 300 Kts. (Mach 0.7) is not exceeded. If continuing, place landing gear control handle at UP and operate the right hydraulic system at 3000 psi. This will hydraulically hold the gear in retract position.

CONDITION
RED LIGHT ON DURING CRUISE WITH LANDING GEAR CONTROL HANDLE IN UP POSITION.

ACTION

1. Operate right hydraulic system at 3000 psi and decelerate aircraft to landing gear extension limitation speed of 300 kts. (Mach 0.7).
2. If light remains on, decelerate to 250 knots for sufficient time for landing gear to retract.
3. If light remains on, continue flight without exceeding landing gear extension speed of 300 kts. (Mach 0.7). Place landing gear control handle at UP position and continue to operate the right hydraulic system at 3000 psi.

881-75 H

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EXPORT AUTHORITY: LICENSE GTDR

A O L
ALL OPERATORS LETTER

FLIGHT OPERATIONS

January 24, 1996
FO-AOL-9-057
FO-AOL-90-003

To: All DC-9, C-9, MD-80, & MD-90 Operators

Subject: DOUGLAS FCOM ABNORMAL PROCEDURE, *"UNABLE* TO *RAISE LANDING GEAR HANDLE AFTER TAKEOFF"*

Applicable to: All DC-9, C-9, MD-80, & MD-90 Aircraft

ATA Chapter No. : 32-00, Landing Gear

Reason: To remind operators of the importance of understanding and adhering to established procedures .

During a recent DC-9 hard landing accident investigation it was determined that ground spoilers were deployed on short final with insufficient altitude remaining to recover from the resulting high sink rate. The aircraft struck approach lights just short of the runway and a hard landing followed. The captain executed a go-around, and returned for a second landing.

Further investigation revealed that upon departure from the originating airport the landing gear handle could not be raised. The crew initiated the appropriate abnormal procedure and determined that the ground shift mechanism was still in the "ground" mode. Per this procedure, the landing gear was raised, and the GROUND CONTROL RELAY circuit breakers were pulled to place the aircraft systems into the "air" mode. During approach to the destination airport, the aircraft was configured for landing and the spoilers were armed for automatic deployment upon touchdown. After consulting the operator's "Quick Reference Handbook", the flight crew elected to reset the circuit breakers while the aircraft was on short final. As a consequence of resetting the breakers, the aircraft was returned to the "ground" mode, resulting in the automatic deployment of the armed spoilers and the subsequent hard landing.

NOTE : The subject Douglas procedure and the operator's "Aircraft Operating Manual" call for the circuit breakers to be reset during post-landing taxi.

JUL-25-1996 12:21 FROM GM FLT OPS DOUGLAS AIRCFT TO 012023826819 P.02

DOUGLAS FLIGHT OPERATIONS TWIN JET Flyer

Volume 2 Issue 2 JUNE 1996

UNABLE TO RAISE LANDING GEAR HANDLE AFTER TAKEOFF

by
Bill Steelhammer
Senior Accident Investigator

A DOUGLAS FLIGHT CREW OPERATING MANUAL ABNORMAL PROCEDURE

During the accident investigation of a recent DC-9 hard landing, it was determined that the ground spoilers were deployed on short final. This resulted in a high sink rate from which them was insufficient altitude to recover. The aircraft struck the runway approach lights, and made a hard landing on the runway from which a missed approach was executed to an uneventful landing.

Upon subsequent investigation it was revealed that after takeoff the gear handle could not be raised. The flight crew initiated the appropriate abnormal procedure and determined that the ground shift mechanism was still in the "GROUND" mode. This abnormal procedure required that after gear retraction the aircraft be put into the "flight" mode by pulling both GROUND CONTROL RELAY C/Bs.

During approach to the destination airport, the aircraft was configured for landing and the spoilers armed for automatic deployment at touchdown. The crew then referred to the Operators Quick Reference Handbook and chose to reset the C/Bs while the aircraft was on short final. This action immediately returned the aircraft to the "GROUND" mode, resulting in the automatic extension of the ground spoilers and the subsequent near disaster.

NOTE: The subject Douglas procedure and the operator's "Aircraft Operating Manual" call for the C/Bs to be reset during taxi.

Normally, automatic spoiler extension requires one of two conditions to be met:

1. Main wheel spinup, or
2. Ground shift mechanism in the "GROUND" mode.

This accident occurred when the second condition was fulfilled on short final.

In this instance, arming the spoilers for landing is acceptable, provided the C/Bs are not reset until after landing. During landing, main wheel spinup will normally actuate autospoiler extension even though the "GROUND" CONTROL RELAY" C/Bs are pulled. Alternatively, it would be acceptable NOT to arm the spoilers prior to landing, but manually extend them after touchdown, provided the associated landing distance penalty is applied (add 470 feet to landing distance on a dry runway or 540 feet on a wet runway).

APPENDIX F - FAA DOCUMENTS/CORRESPONDENCE

PROGRAM TRACKING AND REPORTING SUBSYSTEM DATA SHEET

ECTION I

spector Name Code: RJO Record ID:

ctivity Number: 1260	FAR:	NPG:
atus: (COP) C	Callup Date:	Start Date:
sults: (ACEFISTX) S	Pass/Fail (P/F):	Completion Date 10/8/93
Designator: VJ6A	Airman Cert#:	

irman Name/Other:

ircraft Reg #: N

lake-Model-Series: DC-9

DC/Departure Point: ATL Arrival Point: Flight #:

vestigation # (12):

racking:

liscellaneous:

lumeric Misc

ocal Use

legional Use

lational Use

ctivity Time 10

ravel Time: TRAVEL COSTS:

riggers: (Activity #/ INVS/ REXM/ R # (repeat))

SECTION II - PERSONNEL (unlimited)

Personnel Name:	Position:	Base:	Remarks (25 Characters)

SECTION III - EQUIPMENT (unlimited)

Manufacturer:	Model:	Serial #:	Remarks (23 Characters)

SECTION IV - COMMENT SECTION (unlimited)

COMMENT CODES		
	Primary/Key	Opinion (UPIE)
	A605	I

Comment Text (unlimited length)

VALUJET DC-9 Quick Reference Checklist (HANDBOOK) Reviewed AND Approved.

Date: 10/8/93 Originator: RJO Office: GA FSDO 11

Inspector Signature: Supervisor Initials:

FAA Form 8000-36 (10-89)

GEORGIA FLIGHT STANDARDS DISTRICT OFFICE
1701 COLUMBIA AVENUE - CAMPUS BUILDING
COLLEGE PARK, GEORGIA 30337

February 5, 1996

Mr. Richard Hillman
Senior Vice President Operations
ValuJet Airlines, Inc.
1800 Phoenix Boulevard
Suite 226
Atlanta, GA 30349

Dear Mr. Hillman:

Recent incidents that have occurred during line operations on ValuJet Airlines plus observations made by FAA Inspectors conducting Enroute Surveillance and my own observations whiIe observing new hire pilot training in Miami, have brought to light what appears to be an area of possible concern:

1. In three of the recent incidents/accidents involving ValuJet aircraft, each occured during bad weather and the pilot at the controls was the First Officer. In several cases the Captain was either new and/or had very little Part 121 experience.

2. Inspectors conducting enroute surveillance have found it necessary to council Captains in order to keep them from operating contrary to FAR's and in each case they have been relatively new Captains who had very little experience in Part 121 operations.

3. The new hire class that is currently in training in Miami appears to have only one pilot with prior 121 experience.

4. Recent Enroute Surveillance has indicated that due to the rapid expansion of ValuJet Airlines many of the new Captains have a minimal amount of Part 121 experience. It appears that the Captains are allowing the First Officer to make the takeoff and/or landing out of response to an unwritten practice of alternating that function rather than considering the weather and/or their own need for experience.

There is no doubt that our concerns parallel your own and that you are conducting your own evaluation of the reasons for these events.

Please give this matter your immediate attention and provide this office with your evaluation and actions that you will be taking. Please respond to this letter by March 5, 1996.

Sincerely,

Original Signed by

Robert E. Bruce
Principal Operations Inspector

Bruce:br:02-05-96:h:lowtime

VALUJET
VJ6A465W
ALANTA, GA.
2/14/96

Report prepared by
AFS-300

This report summary addresses ValuJet Airline's accident/ incidents, enforcement history, NASIP Inspections, and the FAA's surveillance activity. Airworthiness concerns following two (2) recent accidents and a DOT Office of Inspector General (OIG) audit of the air carrier are the catalyst of this analysis.

Valujet was originally certified as a domestic air carrier (121) on October 21,1993. Their certificate number is VJ6A465W. ValuJet will be addressed as VJ6A throughout the remainder of this report.

Their principal base of operations is Atlanta, Ga. Additionally, they operate two (2) maintenance facilities at the Hartfield Airport, Atlanta, Ga. and Dulles Airport, Va.

General Information:

VJ6A has an adequate management staff that consists of:

CEO
General Manager
Vice President of Maintenance
Director of Maintenance
Chief Pilot
Director of Operations
Chief Inspector
Director of Aircraft Programs
Director of Technical Services,
Director of Safety

The VP of Maintenance, Director of Technical Services, Director of Aircraft Programs, Chief Inspector, and Director of Safety are recent additions to the management staff.

VJ6A principal inspectors consider ail individuals well qualified for their positions.

VJ6A'S Certificate is managed by the ATL-FSDO, College Park, Ga. The Principal FAA Inspectors are:

PMI	David J. Harper
POI	Robert E. Bruce
PAI	David L. Frantz

VJ6A employs approx. 142 captains, 17 check airman, 4 designated inspectors, 170 pilots, 450 flight attendants, 156 A&P mechanics, 137 ground personnel, and numerous other staff and service personnel.

The primary training location for pilots, flight attendants, and mechanics is Atlanta, Ga.

VJ6A operates 34 DC-9-30 series aircraft and uses contract maintenance facilities for scheduled and unscheduled maintenance away from their main base in Atlanta and the sub-base at Dulles.

Contract Maintenance Organizations:

1. AMR Combs	Windsor Lock, Ct.
2. Signature Flight Services	Boston, Ms.
3. Lane Aviation	Columbus, Oh
4. AMR and NWAA	Dallas, Tx.
5. Jet Center	Fort Lauderdale, Fl.
6. USAIR	Oakland, Ca.
7. David Yocum	Kansas City, Mo.
8. North West	Orlando, Fl.
9. Signature Flight Support	Chicago, IL.
10. North West	Memphis, Tn.
11. Continental	New Orleans, La.
12. Continental	West Palm Beach, Fl.
13. Rick Aviation	Newport news, Va.
14. Northwest	Philadelphia, Pa.
15. Jet South	Fort Myers Fl.
16. AMR	Savannah, Ga.
17. Northwest	Tampa, Fl.

The company phone number is (404) 907-2580.

ACCIDENT/INCIDENT:

Accident History:

1. July 5, 1994 aircraft encountered moderate chop at cruise. One (1) cabin crew member suffered multiple leg fractures no fatalities. The NTSB investigated and determined probable cause as severe turbulence over flight area.

2. June 8, 1995 aircraft experienced a uncontained turbine failure during takeoff roll at Atlanta's Hartsfield Airport, Ga. Five (5) passengers and one (1) cabin crew member were injured no fatalities. The NTSB is investigating, with no probable cause reported.

3. January 71996 during an attempted landing at Nashville, Tn. the aircraft sustained damage to the nose landing gear. The aircraft departed the runway, circled and landed with no nose landing gear. NTSB is investigating, with no probable cause reported. No fatalities or injuries reported.

Incident History:

VJ6A had a total of nine (9) incidents since 1994 with the last one occurring in December 1995.

VIOLATION HISTORY:

VJ6A has a total of 46 violations since 1993 with 20 violation remaining open. Approx. Six (6) of the violations were maintenance related. The FAR's violated are; 43.9,43.13, 121.363, 121.367, and 121.369. No accidents were related to any of these violations.

All maintenance related violation were closed with administrative action (letter of correction). In an analysis of the enforcement action it was noted that a violation of FAR 121.363 occurred two (2) times in less than one (1) year and both closed with letters of correction.

FAA Order 2150.3A specifically states that the letter of corrections sole purpose is to correct conditions which are in violation of the FARs. With the second violation of FAR 121.363 occurring within one (1) of the first violation it appears that the corrective action was not adequate.

NASIP

A NASIP was performed at VJ6A in September 1995. A total 58 findings were noted. The category are:

1. 17 Category A
2. 17 Category B
3. 24 Category C

43 of the 58 findings were maintenance related. While the inspection was completed five months ago, 43 findings have not been closed.

The significant maintenance related NASIP findings are

Manuals and Procedures:

1. Eleven findings were noted with the document that outlines the continued analysis and surveillance program (CAS). The significant findings include

- Problems with CAS forms numbering system
- CAS does not address engine trend monitoring
- Maintenance Manual conflicts with CAS document
- CAS program not accepted by the FAA

- ✥ CAS does not outline audit function
- ✥ CAS does not address emergency response
- ✥ CAS reference a reliability program however, VJ6A has none

2. Fifteen findings were noted with the General Maintenance Manual (GMM) and related documents. The significant findings include

- ✥ GMM conflicts with FAR requirements in several areas
- ✥ Fuel Manual not adequate several important items omitted
- ✥ GMM has conflicting chapters .
- ✥ GMM does not establish guidelines for RII training
- ✥ Winter Ops. Manual reference incorrect information on de-icing fluids
- ✥ Maintenance Check Manual not current in Maint. Planning Dept.

Records Systems:

3. Two findings were noted with the records system they are

- ✥ No engine rendition monitoring records
- ✥ CAS reported a maintenance problem, however, no records were found correcting problem

Maintenance Facilities:

4. Nine findings were noted in the area of Maintenance Facilities. The significant findings include:

- ✥ Parts found in bins without records
- ✥ Parts not identified IAW GMM
- ✥ A system not outlined in the GMM used to track returned parts to stock
- ✥ Part scrapping procedure not addressed in GMM

Ramps and Spots:

5. Four findings were noted in the area of ramps and spots. The significant findings include:

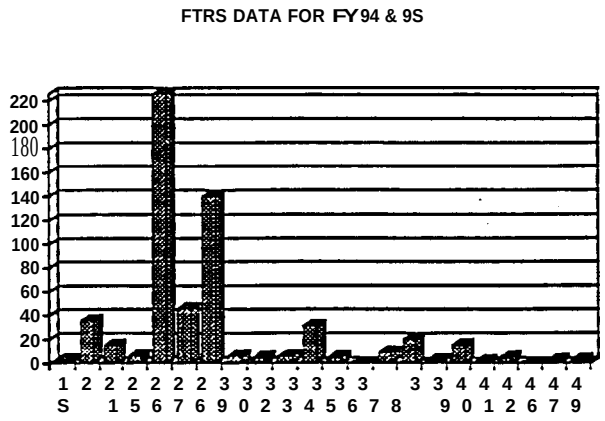
- ✥ MEL procedure not followed
- ✥ Performing maintenance without adequate facilities
- ✥ Performing maintenance with unapproved procedures

FAA SURVEILLANT HISTORY:

The following is an analysis of two (2) years of VJ6A's surveillance activities. The data was obtained from the National PTRS. 22 air carrier specific inspection items were analyzed. They are identified by the surveillance codes as they appear in the PTRS Manual.

A reference table is provided below the histogram that identifies the PTRS Code with the actual inspection function. Example; Number 27 on the chart is a ramp inspection that was accomplished 226 times in two (2) years.

The histogram clearly shows that the most accomplished inspection is the ramp inspection PTRS Code 3627 and the least accomplished is the structural inspection PTRS Code 3646.



Reference:

19. = Main Base	3619= 003
21. = Line Station	3621 = 036
25. = Air Operators Special Inspection	3625 = 015
26. = Manuals and Procedures	3626 = 006
27. = Ramps	3627 = 226
28. = Spot	3628 = 046
29. = En Route	3629 = 141
30. = En Route Cabin	3630 = 006
32. = Shop/Facility	3632 = 005
33. = Training Records	3633 = 006
34. = Aircraft Records	3634 = 031
35. = Continuing Analysis	3635 = 005

36. = Reliability Program	3636 = 002
37. = Inspection Program	3637 = 009
38. = Fuel Facility	3638 = 020
39. = Approved Weight& Balance	3639 = 003
40. = Contract Maintenance Facility	3640 = 015
41. = Maintenance Support Facility	3641 = 002
42. = Technical Manuals	3642 = 005
46. = Structural Inspection	3646 = 000
47. = Structural spot	3647 = 003
49. = Airworthiness Directives	3649 = 003

A total of 588 inspection items were recorded by the certificate management office and geographic inspectors during the work program years of FY 94 and 95.

Of the 588 inspections 359 were satisfactory, eight (8) were not accomplished eight (8) were canceled "X-out", 207 recorded some discrepancy, and six (6) resulted in enforcement action.

36 percent of all inspection accomplished in two (2) years recorded some findings.

It was noted that surveillance code 3636 reliability program inspection was recorded two (2) times with a total of 10 inspector hours charged to an air carrier that does not have a reliability program.

When comparing the NASIP findings with surveillance activities, we clearly see that areas receiving the least attention during the inspection year make up the majority of the maintenance related NASIP tidings.

In addition to the PTRS information a report was run on the Safety Performance Analysis System (SPAS) for VJ6A The report analyzed the following areas:

Records and Procedures
Airworthiness Surveillance
Aircraft Records

The report covered approx. three years of data. In all areas analyzed, VJ6A was at the advisory and or alert threshold in the majority of the months studied.

Additionally, an independent regional aviation safety specialist analyzed VJ6A inspection and surveillance data with virtually the same results and conclusions as this report. This additional sources further validates our hypothesis.

ON U ON

This report addressed VJ6A'S accident/incident, enforcement history, NASIP Inspection and the FAA's surveillance activity. The data reviewed, clearly show some weakness in the FAA's surveillance.

The PTRS data analysis revealed that some critical surveillance activities did not receive much attention. They are as follows

1. Manuals and Procedures PTRS Code 3626 six (6) inspection

2. Shop and Facilities PTRS Code 3632 five (5) inspection

3. Structural Inspection PTRS Code 3646 zero (0) inspections

Although some may argue that six (6) inspections of manuals and procedures is sufficient in two (2) years, you need only look to the recent NASIP Inspection findings to see why more inspections should have been done. 35 of the inspection findings were in the manuals and procedures and shop and facilities area Additionally, the SPAS data for procedures indicate that increased surveillance is warranted. 20 times between December 1993 and January 1996 VJ6A was at the advisory and or alert threshold.

The PTRS data also indicated that no structural inspections were accomplished on VJ6A's aircraft in two (2) years. With a supplemental inspection document (SID) required by AD 87-14-07 to ensure continued structural integrity of an aging fleet of DC-9 aircraft, AFS 300 believes this critical inspection was severely overlooked.

The findings closet date for the September 1995 NASIP inspection is February 28,1996

RECOMMENDATIONS:

Based on VJ6A'S history, The NASIP Inspection NTSB and OIG investigations, and Surveillance AFS-300 can recommend the following actions:

1. Consideration should be given to an immediate FAR-121 re-certification of this airline. This recommendation is based on such known safety related issues as the absence of adequate policies and procedures for the maintenance personnel to follow. Additionally, the absence of engine trend monitoring data, and the possibility of a continuous airwoss maintenance program that may be inadequate because it uses reliability.based procedures without a reliability program.

2. The overall surveillance of the air carrier should be increased in FY96. Special attention should be directed toward manuals and procedures, structural inspections, the

adequacy of the maintenance program, and shops and facilities. Additionally, the PMI should consider accomplishing two (2) main base inspections every year.

3. The close out deadline for the NASIP inspection is February 28, 1996. Every effort should be made to meet this dead line with positive corrective action.

4. When a violation of the FARs are detected the inspector should consider past enforcement history before administrative corrective action is offered. if an air carrier violates the same regulation in a short period of time, escalating the enforcement action may be appropriate.

This report was compiled from information obtained from the national database and VJ6A's NASIP Inspection Report. A physical inspection of the maintenance manual was not conducted by AFS-330

U.S. Department
of Transportation
Federal Aviation
Administration

Memorandum

Atlanta FSDO
Campus Building, Suite 2-110
1701 Columbia Avenue
College Park, GA 30337-2748

Subject: ACTION: ValuJet Special Emphasis Program

Date: February 16, 1996

From: Manager, ATL FSDO

Reply to Attn. of: Spillner:
(404) 305-7200
File:1380-6

To: Manager, Flight Standards Division,
ASO-200

The ATL FSDO will be implementing a special emphasis program for ValuJet Airlines, for a 120-day period, beginning February 20, 1996. The program will consist of four elements. A copy of the plan for the special emphasis program is attached.

The Atlanta FSDO has directed all available air carrier inspectors to this special emphasis program. The program will have a significant impact on the office's ability to meet our mission requirement outside of ValuJet. Attachment two describes the impact on the office.

In addition,we are requesting your assistance in obtaining two qualified air carrier inspectors, preferably with a DC-9 background to assist the POI during the 120-day special emphasis program for ValuJet.

Charles A. Spillner

2 Attachments

cc: ASO-250/ASO-290

02/16/96

ATLANTA FSDO

ValuJet Special Emphasis Program

Background:

ValuJet has experienced several accidents and incidents during the past year. After considerable analysis these occurrences do not appear to be related and the traditional inspection programs (NASIP, RASIP) have not been the key to unlock the reasons for the occurrences. Some other concerns of the ATL FSDO are:

a. ValuJet is an unconventional carrier when compared to moretraditional 121 operators. They are innovators,dedicated to low overhead leasing rather than owning and tightly controlling all expenses, The tight control of expenses includes training (pilot pays), equipment purchases (d), and maintenance (all contracted out to geographically diverse low bidders).

b. An inordinate amount of time that the principal inspectors are having to direct towards answering Congressional, NTSB, DOTIG, DOD, GAO inquiries and FAA safety and consumer hotline issues.

c. An increase in unfavorable geographic reports concerning maintenance discrepancies found by FAA inspectors during revenue operations.

d. A significant decrease in experience level of new pilots being hired by ValuJet es well as other positions such as mechanics, dispatchers, etc.

c. Continuous changes of key management personnel.

f. The ATL FSDO's management will divert critically scarce resources from other carrier assignments to support this effort.

In order to capture a macro view of ValuJet, the ATL FSDO will initiate a special emphasis program beginning February 20, 1996. The program will be conducted for a 120-day period and will consist of four elements. The first element will be to supplement the current ValuJet assignment with additional inspectors. The second element will be to conduct a systems review by placing emphasis on the observations of ValuJet personnel in an operational environment Record inspections will be limited to those records that are being used by ValuJet personnel for the function being observed or to validate a function that bas been observed. Geographical offices will be used to the maximum extent possible to assist the review. They will be provided an updated newsletter outlining our areas of concern.

Element 1. Supplementing the Current ValuJet Assignment:

A separate team will be formed that will be dedicated solely to ValuJet. The team will be headed by George Uhrin. George is an experienced supervisor and has a good working knowledge of the ValuJet assignment. The makeup of the other team members is as follows:

Maintenance: Five qualified air carrier inspectors will be assigned to assist the PMI.

Avionics: The PAI will be relieved of all other assignments.

Operations: The POI and APOI will be relieved of their flight test duties. Two geographic PPM's will be assigned to the ValuJet assignment; however, most of their time will be devoted to flight test duties. No other qualified air carrier operations inspectors are available within the FSDO. The ATL FSDO is requesting the assistance of two air carrier operations inspectors for a 120-day detail to the ValuJet assignment

Element 2. Special Emphasis Review:

Beginning on Thursday, February 22, 1996, the ATL FSDO will conduct a systems review by placing emphasis on the observation of Valujet personnel in an operational environment. Additional emphasis will be placed on an evaluation of ValuJet's accident/incident program and continuing analysis and surveillance program (CAS). The review will continue for a seven-day period. Record inspections will be limited to those records that are being used by Valujet personnel for the function being observed or to validate a function that has been observed. Geographic offices will be used to the maximum extent possible to assist the review.

We will plan on expending the majority of inspectors' time in the field. The principals will remain in the FSDO and track all the data received from the field inspectors. Adjustment will be made during this program based on the data they have received.

The results of this review coupled with information from previous inspections should provide the FSDO with the data needed for a systems analysis of the entire ValuJet operation. The attachments one and two describe the emphasis to be placed in the areas of operations and airworthiness during this review.

Element 3. Analysis:

Once the data is collected, the ATL FSDO will complete an analysis and prepare a report of the findings and recommendations

Element 4. Implement Corrective Actions

Once the corrective actions have been identified, the ATL FSDO will take immediate actions to implement those corrective actions

ATTACHMENT ONE

OPERATIONS

Emphasis will be placed on en route inspections. Inspectors will be assigned to stay with the airplanes all day and report back into the FSDO periodically with their findings.

Passenger service personnel (gate agents):

- Observation of boarding procedures
- Carry-on luggage
- Hazardous material
- General knowledge of company procedures

Cabin Safety:

- The experience level of the number one flight attendant and how long with Valujet
- Observe number 2 flight attendant and exit row seating briefing
- Observe safety equipment inspection
- Coordinate with agent on closing cabin door and arming slide
- Coordinate with pilots/front end crew

Pilots:

- Crew Ordination
- Is the PIC in command?
- Accuracy of load manifest
- Are maintenance discrepancies being recorded as they occur?
- Are discrepancies that the flight attendants give the pilots dealt with correctly?
- Validate training

Training:

- Observe as much training as our resources permit
- . ..for standardization
- . ..for compliance with their approved training program

ATTACHMENT TWO

AIRWORTHINESS

- **Emphasis will be placed on maintenance station and contract facility performance, spare parts and receiving inspection procedures, enroute, ramp and spot inspections, training, and the Continuing Analysis and Surveillance Program.**

Maintenance Station and Contract Facilities:

- Maintenance stations, spares, qualifications of people, tools, equipment How write-ups are handled and if they are properly evaluated and corrected -
- Are they following all procedures completely? What is supervision?
- Review aircraft records (checks, routine maintenance) and verify all the way back. (for compliance with procedures, data, records completion, etc.). If certified repair station, look at certified repair station work order package.
- Visit contract facilities and check proper ratings, facilities, data, equipment, etc. Do they have and use ValuJet manual procedures? Are they properly trained, certificated, and authorized?
- Does ValuJet have evaluations of contract facilities and are they done in person in accordance with their procedures? Is the person conducting them qualified?
- What are the turn-around times at contractors; are there any contract or informal deadlines, etc.?
- See if there is a push to move airplanes.

Spare Parts Management:

- Look at spare parts. Are they properly tagged? Track tags for verification all the way back. How do they integrate into their operation?

En Route, Ramp and Spot Inspections:

- En routes with emphasis on write-ups, carryovers, MEL items. how and when items are written up, general rendition of aircraft.

- Are pilots aware of deferred items and do they handle them properly?
- See if there is a push to move airplanes.

Training:

- Are maintenance people in ValuJet qualified end following procedures Do they have 121 background and experience in the job they are doing?
- Are people properly trained? Review training, curriculums, classes, etc.

Continuing Analysis and Surveillance:

- Review aircraft records looking for trends, types of failures; are they being written upon legs into maintenance facilities, and being deferred and fixed at the same maintenance facilities? What is the length of time involved to get them fixed?

GEORGIA FLIGHT STANDARDS DISTRICT OFFICE
1701 COLUMBIA AVENUE, CAMPUS BUILDING
COLLEGE PARK, GEORGIA 30337

February 27, 1996

Mr. Thomas Kalil
Senior Vice President Operations
and Marketing
ValuJet Airlines, Inc.
1800 Phoenix Boulevard
Atlanta, GA 30349

Dear Mr. Kalil:

In the two and a half years that ValuJet Airlines, Inc. has been certificated, the Federal Aviation Administration has conducted one (1) RASIP and one (1) NASIP inspection. Additionally, the Department of Defense has conducted two inspections. None of these inspections have produced any Findings that would tend to explain the number of recent accidents and incidents that have occurred.

In an effort to uncover any common denominator that might have been present in each incident, this office launched a Special Emphasis Program on February 22, 1996 in which we stepped up FAA surveillance throughout your route structure. It is still very early in our program and although we are not prepared to announce any trends at this time based on our surveillance, we have become aware of certain factors that were present in many case's that could have had some influence on the Captains judgment.

We discussed our concerns with you on February 27, 1996 and informed you that we would follow-up our meeting with a written request for your review of the matter and request a written response from you. The factor that I refer to centers around ValuJet's policy of paying your pilots for the basic leg of the flight only, with no additional pay for extra time flown in the event of a diversion, and with no pay whatsoever in the event the flight turns back. This policy alone would appear to place an undue burden upon the flight crew to complete the flight rather than to divert, and to continue on to the destination rather than land at the nearest suitable airport in the event of a malfunction.

When ValuJet's policy of allowing only "Team Members" (those who have earned their Critter Pin through dedication to the company) to participate in the "Bonus" Program is coupled with the above flight pay policy, we fear that those considerations are influential in the decisions that the Captain makes with regard to the safe operation of his trip.

Please review these policies and provide this office with your thoughts with regard to how these policies may be affecting safety. In responding to this letter, please include a copy of the ValuJet Airlines Pilot compensation program. We would like to have your response by March 15, 1996.

Sincerely,
Original Signed by

Robert E. Bruce
Principal Operations Inspector

Bruce:reb:02-27-96:h:policies

cc:ASO-250

March 15, 1996

ATLANTA FSDO

ValuJet Special Emphasis Program

Background:

ValuJet has experienced several accidents and incidents during the past year. After considerable analysis these occurrences do not appear to be related and the traditional inspection programs (NASIP, RASP) have not been the key to unlock the reasons for the occurrences. Some other concerns of the ATL FSDO are:

a. ValuJet is an unconventional carrier when compared to more traditional 121 operators. They are innovators, dedicated to low overhead, leasing rather than owning and tightly controlling all expenses. The tight control of expenses includes training (pilot pays), equipment purchases (used), and maintenance (all contracted out to geographically diverse low bidders).

b. An inordinate amount of time that the principal inspectors are having to direct towards answering Congressional, NTSB, DOTIG, DOD, GAO inquiries and FAA safety and consumer hotline issues.

c. An increase in unfavorable geographic reports concerning maintenance discrepancies found by FAA inspectors during revenue operations.

d. A significant decrease in experience level of new pilots being hired by ValuJet as well as other positions such as mechanics, dispatchers, etc.

e. Continuous changes of key management persomel.

f. The ATL FSDO'S management will divert critically scarce resources from other carrier assignments to support this effort.

In order to capture a macro view of VaIuJet, the ATL FSDO initiated a special emphasis program on February 20, 1996. The program will be conducted for a 120-day period and will consist of four elements. The following is a summary of the four elements of the program:

Element 1. Supplementing the Current ValueJet Assignment: Several inspectors have been reassigned to the ValuJet assignment. There are now 13 employees dedicated to ValuJet as follows: Supervisor Inspector, Aviation Safety Assistant, POI, PMI, PAI, 4 ACOI's and 4 ACMI's. See attachment one.

Element 2. Special Emphasis Review: The ATL FSDO conducted a seven day systems review (2/22-2/29/96) by placing emphasis on the observation of ValuJet personnel in an operational environment. Geographic offices participated in the review.

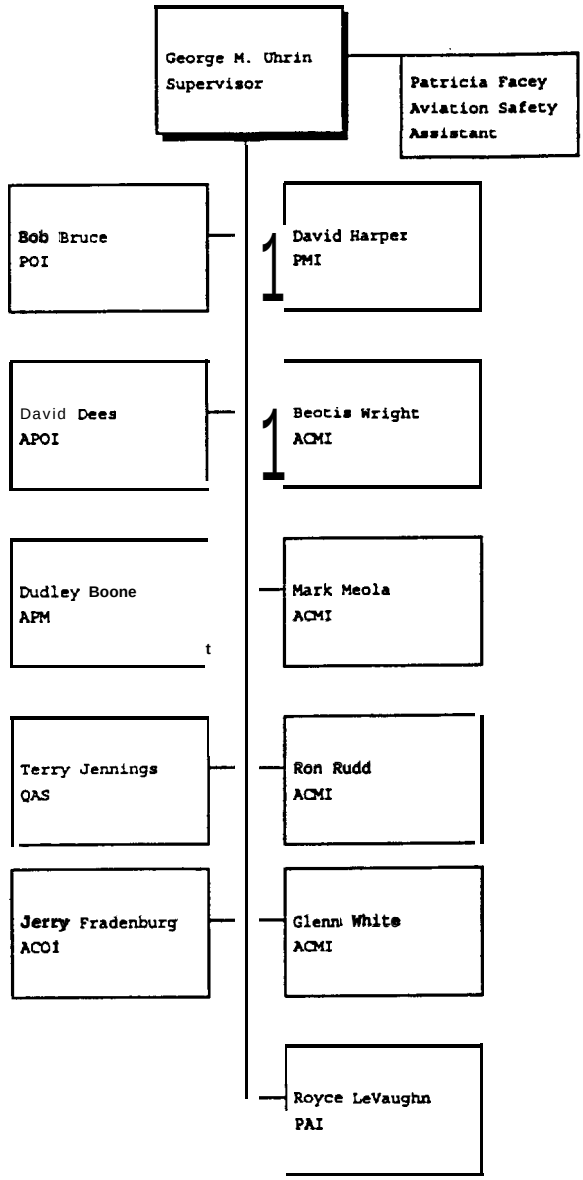
Element 3. Analysis: The ATL FSDO is currently conducting an analysis of the data and will prepare a report of the findings and recommendations. Over 375 inspections were conducted to include art inspection of each of their 43 operational aircraft. Preliminary results, in addition to receiving positive comments, show discrepancies in maintenance inspection programs, MEL management, decision making by cockpit crews, aircrew abnormal checklist training, and gate agent training.

Element 4. Implement Corrective Actions: Once the corrective actions have been identified, the ATL FSDO will take immediate actions to implement those corrective actions. Many corrective actions have all ready been implemented by ValuJet. We consider these actions to be positive for aviation safety. Attachment 2 and 3 contain a summary of ValuJet's actions.

VALUJET SPECIAL EMPHASIS PROGRAM

February 20 through June 14, 1996

VALUJET CERTIFICATE MANAGEMENT TEAM



Attachment 1

VALUJET OPERATIONAL ACTIONS

1. Recent Improvements to ValuJet's Operational Posture.

* They have hired an Operations Manager to oversee the Dispatch Office so that Mr. Joe Reeves could devote his full time to Dispatch Planning.

* They have implemented an In-House Self Audit Program under the direction of Mr. Lloyd Prince, Director of Safety.

* Agreed to hold the following Monthly Meetings with this Office.
  a. Third Thursday. . . . . ..Operations Meeting (attending members are the Chief Pilot, Director of Operations, Director of Training, Sr. VP Ops).

  b. Check Airman meetings w/FAA for standardization of training/checks.

* Initiated a Standard Practice Manual System which is currently under review.

* Developed an agents Training course that will require all agents to be trained in ATL after receiving initial training at their home station.

2. Actions Taken as a result of the Special Emphasis Program.

* Signed an updated contract for a Cockpit Resource Management Program to be taught by Flight Safety International This class was originally to be given only to new hires, but has now been escalated to encompass all pilots. All will have been trained by May 15, 1996.

* They have started holding Captain's Siminars. An 8 hour course that will be given to all upgrading Captains. This will be a retroactive course that will include all current ValuJet Captains. Training of the latter group should be completed by June 1, 1996.

* First Officer Minimums have been raised to 500'AGL and 1 mile for the first 250 hours at ValuJet All current First Officers have been increased to 300' AGL and 3/4 miles.

* Restrictions have been implemented requiring Captains to make all landings on
  a. runways of 7,500 feet or less.
  b. Contaminated runways when braking action is reported as less than good.
  c. Ice or slush is on the runway.
  d During heavy rain.
  c. There is any snow accumulation.

Attachment 2

* Implemented double the FAR requirement for minimum time for crew pairing of new pilots with new Captains.

* Beginning on March 10, 1996, three of Flight Safety International's most experienced check airmen will conduct comprehensive line checks of VJ6A pilots and flight operations over a 10 day period. (They are VJ Check Airmen under contract from Flight Safety).

* Established a monthly Safety Review, to be published by the Check Airmen's Department, covering all incidents involving DC-9's, as well as any related incidents or accidents.

* Established as monthly publication of a Standards letter from the Check Airmen's Department that will include a review of specific procedures and questions about the DC-9.

Bruce:reb:03-15-96 :h:VJ6ASEP

Attachment 2 (cent)

VALUJET MAINTENANCE ACTIONS

1. Recent Improvements to VJ'S Maintenance Organization.

* Hiring of two fill-time auditors to review aircraft records.

* Becoming a member of Coordinating Agency for Supplier Evaluation (C.A.S.E.).

* Implementation of annual Technical procedures audits to evaluate seven distinct elements of the headquarters maintenance organization.

* More intensive follow-up of Quality Assurance (QA) audit findings by monitoring the corrective actions to address discrepancies.

* Significant improvements in tool calibration and stores procedures.

* Strengthening the initial and recurrent training program for Required Inspection Items (RII) Inspectors.

2. Actions taken from the Special Emphasis Inspection.

* Reviewing maintenance work cards for N, A, B, and R Checks.

* Additional training to maintenance personnel who perform N, A, B, and R Checks.

* Strengthen their recurrent training program for mechanics by developing a mandatory course to address General Maintenance Manual (GMM) procedures and policies, FAR requirements and other general subjects.

* Hiring of two additional auditors to monitor maintenance contractors, and to review maintenance records.

* Hiring of four additional inspectors to oversee maintenance of N, A, and B Checks at ATL and IAD.

* Creation of a Technical Support group within line maintenance.

The Technical Support group will be headed by one of ValuJet's most experienced maintenance managers and will be staffed by other highly qualified and experienced maintenance personnel. The group will be stationed in ATL and AID yet be readily available for consultation with or travel to outstation maintenance facilities.

Attachment 3

❧ Agreed to hold the following Monthly Meetings with this Office.

Attending members are the Vice President of Maintenance, Director of Maintenance, Director of Quality Assurance, Chief Inspector, Principal Maintenance Inspector, and Principal Avionics Inspector.