

Log # 2623



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: December 20, 1996

In reply refer to: A-96-166 through -171

Honorable Linda Hall Daschle
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

About 1620 central standard time, 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 National Transportation Safety Board determined 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.¹

¹ For more detailed information, read 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" (NTSB/AAR-96/07)

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 because no airline is exempt from encountering a range of weather extremes, 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.

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 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.

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 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 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.

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, 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.

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 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.

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, 1994,² 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"

² 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)

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"

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.

Therefore, as a result of its investigation of this accident, the National Transportation Safety Board recommends the following 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 nose gear 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)

Also as a result of its investigation, the Safety Board issued Safety Recommendations A-96-172 and -173 to ValuJet Airlines.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: 
Jim Hall
Chairman
