Log 2577

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 14, 1995

In reply refer to: A-95-110 through -113

Honorable David R. Hinson
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On Thursday, February 16, 1995, at 2027 central standard time, a Douglas DC-8-63, N782AL, operated by Air Transport International (ATI), was destroyed by ground impact and fire during an attempted takeoff at the Kansas City International Airport, Kansas City, Missouri. The three flight crewmembers were fatally injured. Visual meteorological conditions prevailed, and an instrument flight rules flight plan was filed. The flight was being conducted as a ferry flight under Title 14 Code of Federal Regulations (CFR) Part 91.[1]

The National Transportation Safety Board has determined that the probable causes of this accident were:

(1) the loss of directional control by the pilot in command during the takeoff roll, and his decision to continue the takeoff and initiate a rotation below the computed rotation airspeed, resulting in a premature liftoff, further loss of control and collision with the terrain.

(2) the flightcrew's lack of understanding of the three-engine takeoff procedures, and their decision to modify those procedures.

[1]For more detailed information, read Aircraft Accident Report -- "Uncontrolled Collision With Terrain, Air Transport International, Douglas DC-8-63, N782AL, Kansas City International Airport, Kansas City, Missouri, February 16, 1995" (NTSB/AAR-95/06)

(3) the failure of the company to ensure that the flightcrew had adequate experience, training, and rest to conduct the nonroutine flight.

Contributing to the accident was the inadequacy of Federal Aviation Administration (FAA) oversight of ATI and FAA flight and duty time regulations that permitted a substantially reduced flightcrew rest period when conducting a nonrevenue ferry flight under 14 CFR Part 91.

As a result of the investigation of this accident, the Safety Board has concluded that the FAA oversight of ATI was inadequate because the ATI principal operations inspector (POI) and the geographic inspectors were unable to effectively monitor domestic crew training and international operations, respectively.

The Safety Board believes that the POI did not have sufficient knowledge of the surveillance that was being performed by FAA geographic units, both in the international operations and at the Denver (DEN) training facility. Additionally, he was not aware of other important facts, such as the new crew resource management program that ATI had started in the recurrent training program, and he had no knowledge of the existence of an ATI crew pairing policy. With the growth in the number of new pilots, he should have been keenly interested in this matter.

Further, he was hampered by restricted funding for travel to DEN to monitor simulator and ground training. He maintained that a lack of funding limited the number of other oversight activities, such as en route observations, especially observations of international operations performed by ATI. While the company was expanding rapidly and hiring large numbers of new pilots, the POI was immersed in the administrative detail of merging two certificates. This limited his time available for other important surveillance functions.

The Safety Board is concerned about the decrease in the number of inspectors assigned to the geographical program at the Denver FSDO. Interviews with DEN geographic inspectors indicated that there was confusion in that FSDO about the future of the geographic program. The Safety Board is also concerned that the pending cutbacks may further weaken the surveillance of supplemental air carrier training functions at the United Airlines Training Center.

An accident in 1994, involving another supplemental air carrier,[2] revealed a serious lack of geographic support. The Safety Board's report stated:

> Many of the flight safety issues brought to the attention of the FAA and the Safety Board were problems that had occurred away from the home base. Due in part to budget constraints, the FAA was dependent upon geographic support for oversight and surveillance of the worldwide operation....the geographic surveillance was vital to the POI's oversight responsibility and should have carried a high priority, considering the fact that foreign operations...required different operational rules and regulations.
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> The Safety Board is concerned that the lack of geographical support required to fulfill the surveillance requirements of the operations is detrimental to the overall ability of the individual inspectors...to ensure that the operations are conducted in accordance with FARs [Federal Aviation Regulations].

Some of the problems with surveillance of supplemental cargo air carriers are that most of their flights are at night; much of the flying is to overseas destinations, and the schedules frequently change. Inspectors must make significant modifications in their work schedules in order to conduct en route observation flights of these operators. The FAA does not appear to take these factors into consideration at this juncture.

Additionally, the communication lines between the POI and the geographic inspectors appear to be occasionally characterized by hostility and resistance to criticism. It was reported that POIs often become "defensive" about the certificates they manage, and at times resent hearing negative comments reported by a geographic inspector from a distant FSDO. The Safety Board believes that this behavior detracts from their effectiveness in achieving the assigned mission.

If the FAA plans to continue the geographic program, changes should be considered, including:

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[2]Refer to Aircraft Accident Report, "Uncontrolled Collision With Terrain, American International Airways, Guantanamo Bay, Cuba, August 18, 1993," NTSB/AAR-94/04.

Better communication links between the POI's and the geographic inspectors.

Adequate staffing of the geographic position.

Increase funding of POI and geographic unit budgets to permit inspectors to schedule flights on supplemental air carriers which occur at nonroutine airports, at nonroutine times.

On another issue, the Safety Board has concluded that the current one-engine inoperative takeoff procedures do not provide adequate rudder availability for correcting directional deviations during the takeoff roll that are compatible with achieving maximum asymmetric thrust at an appropriate speed greater than Vmcg [minimum control speed on the ground].

The high rate of asymmetric throttle application by crewmembers in both the attempted takeoffs precluded successful completion of the maneuver. However, the Safety Board believes that even with the proper application of asymmetric throttle during a three-engine takeoff, the margin of safety is quite small. The procedure now calls for arriving at full takeoff power on the asymmetric engine at the computed Vmcg to provide for the minimum possible takeoff roll. A properly executed three-engine takeoff also entails full rudder application at the computed Vmcg. Any adverse crosswind condition, for instance, would place the flightcrew in a position in which they could not have full control of the airplane due to a loss of rudder authority. In addition, it is very difficult to time the throttle application to arrive at full power at exactly the computed Vmcg, given the spool-up lag inherent in turbine engine operation.

A flightcrew, therefore, invariably reaches full asymmetric power early, and accepts a certain loss of directional control, or reaches full asymmetric power late, and accepts a longer takeoff roll. The Safety Board considers the latter to be the safer course of action, and believes that manufacturers should revise one-engine inoperative takeoff procedures to provide adequate rudder availability for correcting directional deviations during the takeoff roll compatible with the achievement of maximum asymmetric thrust at an appropriate speed greater than Vmcg. Performance figures and runway requirements considering these factors should also be determined.

In another important area relevant to this accident, the Safety Board found that the existing FAR Part 121 flight time limits and rest requirements that

pertained to the flightcrew flights prior to the ferry flights did not apply to the ferry flights, which were flown under FAR Part 91. That situation permitted a substantially reduced flightcrew rest period for the nonrevenue ferry flights.

Just before their assignment to the accident trip, the flightcrew had completed a demanding round-trip flight to Europe that was also a potentially stressful international line check for the captain. These flights crossed multiple time zones (there are five time zones between Dover and Ramstein) in a short period of time. This, and the fact that the Dover-Ramstein-Gander-Dover legs were flown at night following daytime rest periods, caused the crew to experience circadian rhythm disruption. In addition, the captain's last rest period prior to the accident was repeatedly interrupted by the company.[3]

According to the flight time limits and rest requirements of 14 CFR 121.503, following their 9 hours and 29 minutes of flying time to Dover, the crew was required to take a rest period of at least 16 hours before they could legally be assigned to any further Part 121 duty. However, only about 12 hours after checking into the hotel, they checked out to assume duty under FAR Part 91 ferry flight rules. There are no flight time limits or rest requirements for Part 91 ferry flights that follow Part 121 revenue flights.

The investigation could not positively establish the length or quality of sleep that the first officer and flight engineer received. However, in the case of the captain, telephone records and other evidence indicate that his opportunity to sleep in the hours before the accident was considerably disturbed. His longest uninterrupted rest period was 4 hours and 47 minutes. Therefore, the Safety Board believes that he was experiencing fatigue at the time of the accident.

Many scientific studies indicate that fatigue degrades all aspects of performance, especially alertness and judgment. The captain's performance in the accident reveals many areas of degradation in which fatigue is probably a factor. Similar considerations apply to the other two crewmembers, who were also subject to the same schedule and were most likely fatigued at the time of the accident. Several areas of performance degradation exhibited by the crew are characteristic of fatigue, such as the crew's difficulties in setting proper priorities and their

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[3]Rosekind, Mark R., Gregory, Kevin B., Miller, Donna L., Co, Elizabeth L., and Lebacqz, J. Victor, *Analysis of Crew Fatigue Factors in AIA Guantanamo Bay Aviation Accident* as Appendix E of Aircraft Accident Report, "Uncontrolled Collision With Terrain, American International Airways, Guantanamo Bay, Cuba, August 18, 1993," NTSB/AAR-94/04.

continuation of the takeoff attempt despite disagreement and confusion on important issues.

The crew could not legally have flown a revenue trip at the time of the accident. The Safety Board believes, however, that the fact that the flight was legal under the terms of the Part 91 ferry flight provisions does not decrease the amount of rest needed to prevent crew fatigue. Therefore, the Safety Board concludes that the crewmembers were not properly rested. However, the extent to which their fatigue contributed to the accident could not be determined.

On May 18, 1994, the Safety Board issued the following two safety recommendations to the FAA regarding flight time limits and rest requirements. They were issued as a result of the Safety Board's investigation and report on the August 18, 1993, accident at Guantanamo Bay, Cuba, involving the Connie Kalitta Services, Inc., DC-8-61 freighter.[4]

> A-94-105
> Revise the applicable subpart of 14 CFR, Part 121 to require that flight time accumulated in noncommercial "tail end" ferry flights conducted under 14 CFR Part 91, as a result of 14 CFR, Part 121 revenue flights be included in the flight crewmember's total flight and duty time accrued during those revenue operations.
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> and
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> A-94-106
> Expedite the review and upgrade of flight/duty time limitations of the Federal Aviation Regulations to ensure that they incorporate the results of the latest research on fatigue and sleep issues.

The FAA first responded to these recommendations on July 13, 1994, stating that it was considering the issuance of a Notice of Proposed Rulemaking to address both Safety Recommendations A-94-105 and -106. The Safety Board replied on August 11, 1994, classifying both recommendations "Open--Acceptable Response," pending the completion of rulemaking action. To date, the rulemaking action is still pending.

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[4]See NTSB/AAR-94/04 referenced in footnotes 2 and 3.

Because of the fatigue issues uncovered in this and other accidents, the Safety Board believes that it is critical for the FAA to expedite the finalization of the review of current flight and duty time regulations and to revise the regulations, as necessary, within 1 year to ensure that flight and duty time limitations take into consideration research findings in fatigue and sleep issues. Further, the new regulations should prohibit air carriers from assigning flightcrews to flights conducted under 14 CFR Part 91 unless the flightcrews meet the flight and duty time limitations of 14 CFR Part 121 or other appropriate regulations. Accordingly, the Safety Board is classifying Safety Recommendations A-94-105 and -106 "Closed--Acceptable Action/Superseded" and is issuing a new recommendation.

Therefore, as a result of its investigation of this accident, the National Transportation Safety Board recommends that the FAA:

> Review the effectiveness of the geographic unit oversight program, with particular emphasis on the oversight of supplemental air carriers and their international operations, and the improvement of overall communications between principal operations inspectors and geographic inspectors. (Class II, Priority Action) (A-95-110)
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> Evaluate the surveillance programs to ensure that budget and personnel resources are sufficient and used effectively to maintain adequate oversight of the operation and maintenance of both passenger and cargo air carriers, irrespective of size. (Class II, Priority Action) (A-95-111)
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> Require airplane manufacturers to revise one-engine inoperative takeoff procedures to provide adequate rudder availability for correcting directional deviations during the takeoff roll and provide performance figures and runway requirements compatible with the achievement of maximum asymmetric thrust at an appropriate speed greater than ground minimum control speed. (Class II, Priority Action) (A-95-112)
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> Finalize the review of current flight and duty time regulations and revise the regulations, as necessary, within 1 year to ensure that flight and duty time limitations take into consideration research findings in fatigue and sleep issues. The new regulations should

prohibit air carriers from assigning flightcrews to flights conducted under 14 Code of Federal Regulations (CFR) Part 91 unless the flightcrews meet the flight and duty time limitations of 14 CFR Part 121 or other appropriate regulations. (Class II, Priority Action) (A-95-113)

Also, the Safety Board issued Safety Recommendations A-95-114 and A-95-115 to Air Transport International.

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

By: Jim Hall
Chairman

Safety Recommendation Reiteration List

SR Number	Reiteration Number	Report Number	Report Date	Accident Description	Accident City	Accident State	Accident Date
A-95-113	1	SR-99-01	6/1/1999	Study Evaluation of U.S. Department of Transportation Efforts in the 1990s to Address Operator Fatigue	N/A	N/A	N/A