



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Log 2302

Date: July 23, 1991

In reply refer to: A-91-54 through -66

Honorable James B. Busey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On December 3, 1990, at 1345 eastern standard time, Northwest Airlines (NWA) flight 1482, a McDonnell Douglas DC-9, and Northwest Airlines flight 299, a Boeing 727 (B-727), collided near the intersection of runways 09/27 and 03C/21C at Detroit Metropolitan/Wayne County Airport (DTW), Detroit, Michigan. The DC-9 was to be a regularly scheduled passenger flight to Pittsburgh, Pennsylvania, and the B-727 was to be a regularly scheduled passenger flight to Memphis, Tennessee. Both airplanes were operating under Federal Aviation Regulations (FAR) Part 121 and instrument meteorological conditions prevailed at the time at DTW. The B-727 was on its takeoff roll on runway 3C at the time of the collision, and the DC-9 had taxied onto the runway just prior to the accident. The B-727 was substantially damaged, and the DC-9 was destroyed during the collision and subsequent fire. Of the 40 passengers and 4 crewmembers aboard the DC-9, 7 passengers and 1 flight attendant received fatal injuries. None of the 146 passengers and 8 crewmembers on the B-727 were injured.¹

Airport Signs, Lighting and Marking

The Safety Board recognizes that maintenance of all signs, lights and pavement markings on an airport as large as DTW is a demanding task. However, some rather obvious shortcomings in this area were apparent. Although most of these shortcomings are not violations of any FARs, they reflect a disregard for the guidelines in several Federal Aviation Administration (FAA) advisory circulars concerning airport operations. The FAA was aware of some of these shortcomings and could have taken actions to correct them prior to the accident.

¹For more detailed information, read Aircraft Accident Report, "Northwest Airlines, Inc., Flights 1482 and 299, Runway Incursion and Collision, Detroit Metropolitan/Wayne County Airport, Michigan, December 3, 1990" (NTSB/AAR-91-05)

The investigation revealed several areas of faded or nearly invisible taxi lines on the airfield, especially near the area where the DC-9 was taxiing. These deficiencies may have been a factor in the DC-9 flightcrew's incorrect decision to turn left onto the Outer taxiway. The Safety Board believes that the repainting of the faded taxiway centerlines should be performed as soon as they are noted during daily airport inspections instead of during a set schedule for overall airport restriping.

Although the investigation determined that the size, coloration, and lighting of the airport signs in question met or exceeded regulatory requirements, the location and annotation of several signs observed by the DC-9 crew bear further discussion. For instance, the Oscar 6 sign at the intersection of Oscar 6 and the Outer taxiway misled the flightcrew into believing that they were on Oscar 6 when they were not. Adding an arrow and an OTR/arrow to this sign might clarify its meaning. Along the Outer taxiway, there were no signs to indicate to the pilots that they were approaching the Oscar 4 taxiway. It is logical to assume that Oscar 4 would be the next available taxiway after Oscar 5, when taxiing east, but in this case, the turnoff to Xray taxiway is next. In fact, several investigators, some of whom were current airline pilots, were confused by the signage in this area when they observed it on a clear day after the accident. The inspectors of the signage from the airport and the FAA are not airline pilots and, in some cases, are not pilots of any type of aircraft. The Safety Board believes that more user input should have been sought when the decision was made to place some signs at DTW. Also, the two hold lines in the Oscar 4 area were parallel to runways instead of perpendicular to their respective taxiways. Flightcrews expect hold lines to be at right angles to taxiway centerlines and, in this accident, the DC-9 crew may have seen the yellow markings but could have failed to recognize them as hold lines because of the angle relative to the taxi path.

The absence of runway edge lights on runway 3C/21C in the Oscar 4/runway intersection area also probably contributed to the flightcrew's actions. If the lights had been imbedded in the pavement at intervals of 200 feet, as recommended by the Advisory Circular 150/5340-24, the DC-9 pilots would probably have noticed them before the runway incursion and stopped taxiing. The Safety Board notes that the single runway edge light that the captain eventually observed prompted him to taxi to the left of the runway centerline during the incursion.

Because of the discrepancies discovered during this investigation, the Safety Board is concerned that oversight by DTW managers and FAA Airport Safety and Certification Inspectors was lacking. These discrepancies should have been identified and corrected routinely after daily airport inspections by DTW personnel or by FAA inspectors during annual certification inspections. The Safety Board is concerned that the problem of complex intersections, which can confuse pilots, exists at other airports and presents a situation that would require additional lighting and signage.

Rescue and Fire Fighting

An attempt to replenish water at a fire hydrant located at the taxiway Xray and runway 9/27 intersection was unsuccessful because the water supply to this hydrant had been shut off for maintenance. Airport fire department officials had not been notified that the hydrant was out of commission. This dry hydrant had no detrimental effect on the overall rescue operation.

Flight Attendant and Pilot Training

The Safety Board believes that NWA flight attendants received inadequate training in the operation of the DC-9 tailcone. The DC-9 tailcone exit release handle simulator used for flight attendant training prior to the accident consisted of a platform to stand on, a pole rising obliquely, and a release handle mounted at the end of the pole. It was inadequate as a realistic training aid because:

The release handle was not installed in clips that would have represented the forces required to pull the handle free;

The training device was not installed in a realistic environment that represented a fully enclosed tailcone with low levels of ambient illumination;

A door or hatch was not used to gain entry to the handle simulator.

FAA Air Carrier Operations Bulletin 8-76-46, Crewmember Emergency Training, Use of Mockups, states, "For those exits where it is impractical for each individual to operate the exit or device, such as the DC-9 tailcone, a group demonstration will suffice provided it is supported by a realistic, detailed visual/pictorial presentation." The Safety Board believes that this guidance should be eliminated. Flight attendants should have hands-on experience with any exits that they may be required to operate during an emergency evacuation.

The taxi sequence leading up to the runway incursion was accomplished in very low-visibility conditions. During the taxi sequence, neither pilot appeared to have routinely referred to the directional indicators on the airplane to help determine their position. For instance, if they had checked the aircraft heading, the fact that they were then taxiing due east for hundreds of feet (an impossibility on taxiway Oscar 6 which was oriented northwest/southeast) should have been a sufficient cue to prompt the captain to stop taxiing, determine his exact position, and request specific instructions from the ground controller to proceed.

The Safety Board believes that if the pilots had admitted to themselves that they were lost at some point, and if they had acknowledged this to the ground controller, they might have prompted the controllers to take appropriate action, which could have prevented the accident. Airline operations' manuals and pilot training programs rarely, if ever, contain instruction and techniques for low-visibility taxi operations.

Air Traffic Control

In analyzing this accident, the Safety Board examined the actions that could have been taken by the ground controller to prevent the runway incursion. After determining that the DC-9 had missed Oscar 6 and was in the vicinity of Oscar 5, after having inadvertently turned eastbound on the Outer taxiway, the controller had some options. Because the Oscar 4 area had been identified in materials available to him as a potential runway incursion hazard, the controller could have kept the airplane away from that area by directing it back to the Oscar 6 throat via Oscar 5 and the Inner taxiway. The Safety Board believes that many controllers would not have used this option, particularly when communicating with a professional airline crew presumably familiar with their hub airport. Having opted to route the flight toward the Oscar 4 area, however, the controller could have taken other precautions. He could have begun issuing progressive taxi instructions, informing the crew to continue to the next taxiway intersection--identifiable by the sign for Outer/Xray--and hold short. Furthermore, recognizing the low-visibility conditions and the problems already experienced by the DC-9 crew, he could have requested the local controller to suspend takeoff activity until he was certain that the DC-9 was in fact across runway 9/27 clear of the Oscar 4 area and established on taxiway Xray.

The local controller testified that he decided not to issue a safety warning to the crew of the B-727 because he believed that the airplane was already airborne. However, his decision that the airplane was already airborne was based on a faulty assumption. Although enough time had elapsed since he issued the takeoff clearance to lead him to believe that the airplane was airborne, he had not observed the departure on the BRITE (bright radar indicator tower equipment) and had no valid reason to assume that it had indeed taken off. Although the crew of the B-727 performed their final checklist items in a normal time span, it took them a while to get into position on the active runway and begin the takeoff. Considering his inability to observe the airplane, the local controller could have asked the flightcrew to report "rolling." In fact, the local controller had cleared another aircraft into position before the B-727 began to roll. The local controller could have known that the airplane was airborne only by the receipt of a call from the flight or by an observation of the flight on the BRITE radar. Neither of these confirmations occurred; therefore, the local controller should have considered that the airplane was still on its takeoff roll.

The supervisor became involved in the runway incursion immediately after the ground controller announced that the DC-9 was "lost," and the Safety Board believes that her quick response to stop all traffic was appropriate. However, if she had been monitoring the situation as it developed, she might have detected the positional uncertainty of the DC-9 flightcrew and acted more promptly to stop the taxi operation, or at least have told the local controller to warn the B-727 of the potential collision threat. In addition, more direct attention might have prompted the supervisor to question the accuracy of the prevailing visibility reading.

The Safety Board has repeatedly expressed its concern about the lack of automated redundancies for tower controllers, such as currently exists for radar controllers. Similarly, the Safety Board is concerned that the current philosophy of operating with no specific human redundancy for tower controllers will permit a single human error to occur, go undetected, and lead to another accident. Given the critical nature of the responsibilities of air traffic controllers, there is often no tolerance for any human error. Therefore, procedures or technological advances should be implemented to provide equivalent redundancy for tower controller tasks. For example, direct supervision of tower operations seems appropriate for certain operational conditions so that a second person will be aware of developing situations that need intervention. Similarly, procedures requiring the use of progressive taxi during low-visibility conditions could provide more control and awareness to ground controllers of aircraft locations on the airport. The implementation of procedural redundancies could involve general national guidelines for supervision, as well as site-specific guidelines and procedures for certain airports with unique operating environments. Therefore, the Safety Board believes that the FAA should immediately develop and implement procedures and policies to provide human redundancy of critical controller tasks, and should expedite the development and installation of redundant hardware systems.

The FAA National Aviation Safety Inspection Program (NASIP)

The Safety Board was disappointed to discover during its public hearing that personnel comprising the inspection teams can, unlike in the past, be the same people responsible for surveilling the organization receiving the inspection. Five of the seven NASIP team members inspecting the NWA Atlanta facility were from the Atlanta Flight Standards District Office (the office delegated by the Certificate Management Office (CMO) to oversee many aspects of NWA maintenance in Atlanta) or from the CMO itself. This new policy defeats one of the most valuable purposes of a NASIP inspection--using outside evaluators to evaluate the FAA's own surveillance of an operator's procedures.

The Safety Board supports the NASIP-type special in-depth inspection program by the FAA to verify the adequacy of its routine surveillance program. However, the Safety Board believes that NASIP effectiveness could be significantly enhanced by two means. First, an assessment of local FAA surveillance effectiveness should be a formal goal of NASIP inspections so that NASIP findings can be used to correct the deficiencies of local inspectors, as well as those of the airline.

Second, the Safety Board continues to believe that the correction and closeout of negative findings of a NASIP team should be reviewed and approved by the NASIP team leader, rather than just by the local inspectors under whose jurisdiction the negative findings existed. The Safety Board addressed this issue earlier in its report of the Aloha Airlines Inc., B-737-200, accident on April 28, 1988, when it recommended that the FAA:

Integrate the National Aviation Safety Inspection Program team leader in the closeout of the [NASIP] team findings. (Class II, Priority Action) (A-89-65)

The FAA Administrator's reply to this recommendation, dated October 25, 1989, was not responsive because the FAA did not intend to include the NASIP team leaders in the evaluation of the closeout because such duties were not in its job function. Further, the FAA stated that it would follow implementation of corrective actions by means of an automated tracking system to record all NASIP followup actions. The Safety Board does not believe that this system is sufficient to provide the understanding of the intricacies of the problems that led to the original findings. Consequently, in a letter to the FAA, dated April 16, 1990, the Safety Board classified the status of A-89-65 as "Open--Unacceptable Action," pending further evaluation by the FAA.

The Safety Board believes that the detailed nature of NASIP inspections and the fact that deficiencies noted by the teams were permitted to occur, or the fact that they were overlooked by the local FAA office, indicate the need for the insight of the NASIP team leader in the closeout of the findings. Therefore, the Safety Board reiterates its concerns expressed in Safety Recommendation A-89-65 and urges the FAA to consider amending its policies for evaluating the closeout of NASIP findings.

The FAA Postaccident Drug Testing Program

Following this accident, the FAA took a narrow view when determining which controller to test, and decided to test only the ground controller. As a result, both the local controller, who was the last controller to communicate with the B-727 before the collision, and the area supervisor, who had overall responsibility for the tower operation, were not tested. Similarly, the FAA air traffic management made a decision following the runway collision at Hartsfield International Airport, Atlanta, Georgia, on January 18, 1990, to limit testing and did not test controllers who were later cited by the Safety Board as being causally related to the accident.

The Safety Board continues to believe that because a proper decision cannot be made within a reasonable period of time regarding whom to test immediately following an accident, specimens should be collected quickly from all those who are "reasonably associated with the circumstances of an accident." The decision as to which specimens to send to the laboratory for analysis can be made after more investigative information is available.

The Safety Board raised the fundamental issue of requiring the collection, especially after accidents or incidents, of blood and urine and screening for a broader range of drugs, including alcohol and prescription drugs that impair, in Safety Recommendations I-89-4 through 12 in December 1989. These recommendations were addressed to the Secretary of Transportation. A response to these recommendations was received from the Secretary on August 3, 1990. The cover letter from the Secretary stated that his Special Assistant for Drug Enforcement and Program Compliance would enter into discussions with the Safety Board on the recommendations. Numerous

discussions were held, and the Safety Board was led to believe that there was support in the Secretary's Office for these recommendations. However, the Special Assistant vacated the Secretary's Office in March 1991, and no apparent progress on these recommendations has been made. As a result, on May 31, 1991, the Safety Board wrote to the Secretary expressing its concern about the lack of progress and classified Safety Recommendations I-89-04 through -09, -11 and -12 as "Open--Unacceptable Response."

Therefore, as a result of the investigation of this accident, the Safety Board recommends that the Federal Aviation Administration:

Improve standards for airport marking and lighting during low-visibility conditions, such as standards for more conspicuous marking and lighting; evaluation of unidirectional taxi lines for use on acute angle taxiways; and requirements for stopbars or position-hold lights at all taxiways that intersect active runways. (Class II, Priority Action) (A-91-54)

Identify, at all 14 CFR 139 certificated airports, complex intersections, where a potential for pilot confusion exists. Where needed, require additional lighting and signs. (Class II, Priority Action) (A-91-55)

Require that CFR 139 certificated airports use reflectorized paint for airport surface markings. (Class II, Priority Action) (A-91-56)

Require that CFR 139 certificated airports install semiflush runway edge lights in accordance with Advisory Circular 150/5340-24. (Class II, Priority Action) (A-91-57)

Include directions, in the forthcoming Advisory Circular for Surface Movement Control Guidance Systems, that 14 CFR 139 certificated airports, which operate at runway visual ranges of 1,200 feet or less, follow ICAO Annex 14 standards. (Class II, Priority Action) (A-91-58)

Include guidance in Advisory Circular 150/5220-4, Water Supply Systems for Aircraft Fire and Rescue Protection, that addresses the need for fire departments to be notified in a timely manner when hydrants and water supply systems used for fire fighting are inoperable. (Class II, Priority Action) (A-91-59)

Issue an Advisory Circular addressing acceptable methods for the design, construction, operation, and maintenance of mockups used for exit training during crewmember emergency training, and provide guidance to FAA inspectors to ensure that emergency equipment training devices accurately replicate the intended operational environment. (Class II, Priority Action) (A-91-60)

✓ Require that air traffic control tower managers reemphasize the concept and use of progressive taxi/progressive ground movement instructions during low-visibility ground operations in local Operations Position Standards Handbooks. (Class II, Priority Action) (A-91-61)

✓ Require that air traffic control tower managers emphasize to local controllers the need for positive determination of airplane departures in IFR conditions when direct visual observations of departing airplanes are not possible. (Class II, Priority Action) (A-91-62)

✓ Develop and implement procedures for redundancy of critical controller tasks, and expedite the development and installation of hardware systems to supplement such redundancy. (Class II, Priority Action) (A-91-63)

Require that during National Aviation Safety Inspection Program (NASIP) inspections, the majority of the team members be from different FAA regions than FAA personnel being inspected. (Class II, Priority Action) (A-91-64)

Require that an assessment of local FAA surveillance effectiveness be a formal part of NASIP inspections, so that NASIP findings can be used to correct observed deficiencies of local inspectors as well as those of the airline. (Class II, Priority Action) (A-91-65)

Require that the subject of low-visibility taxi problems become a recurring subject in all airline operations manuals and pilot training forums. (Class II, Priority Action) (A-91-66)

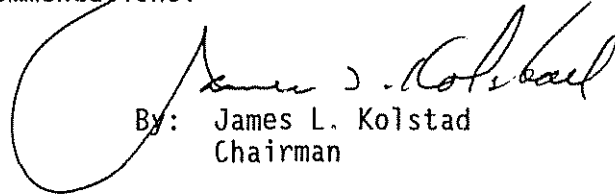
In addition, the Safety Board reiterates the following safety recommendations to the Federal Aviation Administration:

Integrate the NASIP team leader in the closeout of the team findings. (A-89-65)

The regulations concerning drug testing of U.S. Department of Transportation employees should provide testing requirements that include alcohol and drugs beyond the five drugs or classes specified in the Department of Health and Human Services (DHHS) guidelines and that are not limited to the cutoff thresholds specified in the DHHS guidelines. Provisions should be made to test for illicit and licit drugs as information becomes available during an accident investigation. (I-89-9)

Also, the Safety Board issued Safety Recommendations A-91-67 and A-91-68 to the Detroit Metropolitan/Wayne County Airport; and A-91-69 to Northwest Airlines, Inc.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, BURNETT, LAUBER and HART, Members, concurred in these recommendations.



By: James L. Kolstad
Chairman