



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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**Date:** March 3, 2003

**In reply refer to:** A-03-05 and -06

Honorable Marion C. Blakey  
Administrator  
Federal Aviation Administration  
Washington, D.C. 20591

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On September 25, 2001, about 0348 mountain daylight time (MDT), United Parcel Service (UPS) flight 896, a Boeing 757 with two crew members aboard, took off from a closed runway (runway 8) at Denver International Airport, Denver, Colorado. The airplane passed within 32 feet of a temporary light fixture near an adjacent taxiway (taxiway R7) that was undergoing construction. No injuries were reported on the ground or on board the airplane, and the flight continued uneventfully to its destination. Nighttime visual meteorological conditions prevailed. The flight was conducted under the provisions of 14 *Code of Federal Regulations* (CFR) Part 121 as a cargo flight from Denver to Reno, Nevada.

Runway 8 was closed at 2200 MDT on September 24 because of construction workers and equipment operating on taxiway R7. The construction area on taxiway R7 was clearly marked, lighted, and barricaded. Runway 8 and the runway entrances (other than those at R7) were not marked as closed or obstructed in any way, and the lights on runway 8 were illuminated. About 0340, the flight crew of UPS flight 896 contacted the Denver tower local controller for taxi instructions, advising that it had arrival Automatic Terminal Information Service (ATIS) information "Hotel."<sup>1</sup> About 0342, the tower controller advised UPS flight 896 that departure ATIS information "Victor" was current, and the crew acknowledged. At 0342:16, the tower controller instructed the flight crew to taxi to runway 35L and to advise her when it was ready for departure. At 0343:57, the pilots requested a change to runway 8 because they did not have the necessary departure data aboard to use runway 35L. The tower controller responded, "UPS896 no problem, continue northbound to runway 8."

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<sup>1</sup>ATIS is the continuous broadcast of recorded non-control information in selected terminal areas. Each broadcast has a coded identifier that is used to confirm that flight crews have the correct ATIS data. Pilots are responsible for obtaining the appropriate ATIS information; controllers are responsible for either verifying pilots have done so or providing the information. About the time of flight 896's departure, information Hotel was the current arrival ATIS and information Victor was the current departure ATIS. Both stated that runway 8 was closed.

According to postincident statements provided by the crewmembers of flight 896, they noticed the construction activity on taxiway R7 as they approached runway 8 and estimated that the activity was about 5,000 feet away. While the aircraft was moving into position on the runway, the captain asked the first officer “what all the lights were about.” At 0347:45, the flight crew reported ready to depart at runway 8, and the tower controller cleared the flight for takeoff.<sup>2</sup> The crewmembers indicated that the runway appeared to be clear, so they proceeded with the takeoff. They reported that the aircraft passed through a cloud of dust next to the construction area but that the takeoff was otherwise normal. Both crewmembers reported that they were unaware that the runway was closed until the next day when UPS notified them that the aircraft had nearly struck a barricade. The captain stated that he did not recall if the runway closure information was on the ATIS broadcast.

About 0351, a person identifying himself as “Engineering 567”<sup>3</sup> transmitted, “Engineering 567, 8-26 is believed closed?” The tower controller responded, “Agent air 526 [sic] affirmative.” She then transmitted, “Oh!” At 0351:51, Engineering 567 asked, “why did a plane take off from 8-26?” The controller did not respond. After the construction crew notified airport management of the incident, it terminated construction activity for the night.

According to Denver airport management and local Federal Aviation Administration (FAA) air traffic management, the runway closure was coordinated with the tower and was part of a construction project that spanned several nights. However, a notice to airmen (NOTAM) about the closure was not issued because the communications system connecting the Denver airport operations office and the FAA’s Denver automated flight service station (FSS) failed. Although a NOTAM was transmitted from the airport operations office to the FSS, no acknowledgement of the transmitted NOTAM message was received, and the operations office did not follow up. However, the tower was notified directly by airport operations personnel when the closure went into effect.

The Safety Board notes that although this incident did not result in damage or loss of life, in another instance, inadvertent use of a closed runway had fatal results. The October 31, 2001, accident involving Singapore Airlines in Taiwan claimed 83 lives when the flight crew departed from a partially closed runway that was obstructed by heavy construction equipment.<sup>4</sup> There were no markings indicating that the runway was closed. The construction area was located approximately 4,000 feet down the runway and may not have been readily visible to the flight crew because of high winds and heavy rain.

International Civil Aviation Organization (ICAO) International Standards and Recommended Practices, Annex 14, Volume 1, “Aerodrome Design and Operations,” states that, “[a] closed marking should be displayed on a temporarily closed runway or taxiway or portion thereof, except that such marking may be omitted when the closing is of short duration and adequate warning by air traffic control services is provided.” Annex 14 further states that, “[o]n

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<sup>2</sup> Authorizing UPS flight 896 to depart on a closed runway was contrary to Federal Aviation Administration (FAA) procedures. The controller was charged with an operational error as a result.

<sup>3</sup> Engineering 567 was a member of the construction crew at taxiway R7.

<sup>4</sup> The description for this accident, DCA01RA002, can be found on the Safety Board’s Web site at <<http://www.nts.gov>>.

a runway a closed marking shall be placed at each end of the runway, or portion thereof, declared closed, and additional markings shall be so placed that the maximum interval between markings does not exceed 300 meters.”

Title 14 CFR Section 139.341, “Identifying, marking, and reporting construction and other unserviceable areas” requires the marking and, if appropriate, lighting of construction areas and other unserviceable areas on the airport but does not require physical barriers to such areas. Section 139.343, “Noncomplying conditions,” states that “[u]nless otherwise authorized by the Administrator, whenever the requirements of Subpart D of this part cannot be met to the extent that uncorrected unsafe conditions exist on the airport, the certificate holder shall limit air carrier operations to those portions of the airport not rendered unsafe by those conditions.” The Safety Board notes that, if necessary, airport operators may comply with Section 139.343 by closing the affected area without taking any other action.

FAA guidance to airport operators regarding runway markings for closed runways is contained in Advisory Circular (AC) 150/5340-1H, “Standards for Airport Markings,” paragraph 41. The AC, which is not directive or regulatory in nature, advises that “when it is necessary to provide a visual indication that a runway is temporarily closed, X's are placed only at each end of the runway on top of the runway designation markings or just off the runway end when required by construction activity.” Although the AC provides additional guidance regarding the placement, color, and dimensions of these markings, it does not explicitly indicate the circumstances under which the markings must be used and notes the following:

The airport operator is responsible for determining the need for a visual indication that a runway or taxiway is closed and for determining the safest place to put the X. In making this determination, the airport operator should consider such things as the reason for the closure, duration of the closure, airfield configuration, and the existence and hours of operation of the airport traffic control tower.

Thus, although the regulations appear to require marking of closed runways, the AC gives airport operators the discretion to determine whether such markings are needed.<sup>5</sup>

The Safety Board is concerned that existing FAA regulations and guidance do not explicitly require the use of conspicuous signage, barricades, or other physical indications that will reliably prevent arriving and departing aircraft from inadvertently using runways that are closed or unusable. Although the Board is concerned that current regulations and guidance regarding runway closure indications do not sufficiently minimize the likelihood that a human error will result in a serious accident, it also recognizes that it may not be practicable to use physical barriers on closed runways in all circumstances. For example, brief closures for

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<sup>5</sup> The Safety Board notes that on January 8, 2002, the FAA issued an advisory “CERTALERT” memorandum to remind airport certification safety inspectors and airport operators of requirements for marking and lighting closed runways. This memorandum stated that “for temporary maintenance closures, airport operators should develop standard operating procedures that include notification of airport users, ... markings and general safety guidelines.” The memorandum also encouraged operators to use a lighted “X” signal and a barricade or stop bars at major entrances to closed runways to prevent aircraft from entering, and to disconnect or cover runway edge and threshold lights on closed runways.

activities such as runway inspection, friction measurement, or snow removal may not warrant the effort required to install significant physical barriers or lighting devices that limit access to the closed area. However, closures that involve the presence of personnel and equipment on or near a runway for an extended period of time increase the potential hazard in the event of an inadvertent takeoff or landing. Therefore, the Safety Board believes that the FAA should require the use of physical devices or other means to clearly indicate to flight crews of arriving and departing aircraft that a runway is closed.

Following this incident, airport management and FAA staff expressed concern about the possible hazards associated with placing currently available marking devices such as trailer-mounted lighting equipment on closed movement areas. The Safety Board recognizes that the installation of physical barriers, such as vertical "X" closure indicators mounted on trailers or other vehicles, may present hazards in terms of nonfrangibility and collision risk if an aircraft operates on a closed runway despite the presence of such devices. However, the activities or conditions that would cause a runway to be closed may present a greater hazard than that resulting from placement of the lighting and marking devices. Therefore, the need to protect aircraft from such hazards must be balanced against any concerns about the methods and equipment being used to effect runway closures. The Safety Board anticipates that any regulations the FAA may implement pursuant to this recommendation letter will not only establish clear minimum standards for the lighting and marking of closed movement areas but will also consider the need to apply good judgment in identifying the appropriate actions and types of equipment to be used during closures.

Because inadvertent operation on closed runways may result in serious accidents, the Safety Board encourages the FAA to act expeditiously to establish mandatory lighting and marking regulations using existing technology but recognizes that there may be room for improvement in the design and construction of existing lighting and marking equipment. Such improvement may enhance safety and increase the likelihood that the equipment will be used when needed. Therefore, the Safety Board believes that the FAA should study the safety and design of existing safety barrier and lighting equipment intended for placement on or near runways during closures and establish safety standards for frangibility, as well as other properties (including, but not limited to, wind resistance and conspicuity of lights and markings under various weather, lighting, and visibility conditions). If existing equipment does not meet these standards, new equipment should be developed.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require the use of physical devices or other means to clearly indicate to flight crews of arriving and departing aircraft that a runway is closed. (A-03-05)

Study the safety and design of existing safety barrier and lighting equipment intended for placement on or near runways during closures and establish safety standards for frangibility, as well as other properties (including, but not limited to, wind resistance and conspicuity of lights and markings under various weather, lighting, and visibility conditions). If existing equipment does not meet these standards, new equipment should be developed. (A-03-06)

Acting Chairman HAMMERSCHMIDT and Members GOGLIA, BLACK, and CARMODY concurred in these recommendations.

By: John A. Hammerschmidt  
Acting Chairman