



National Transportation Safety Board

Washington, D. C. 20594

Safety Recommendation

LOG 2101

Date: October 24, 1988

In reply refer to: A-88-115 through -119

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On February 3, 1988, American Airlines flight 132, a McDonnell Douglas DC-9-83, departed Dallas/Fort Worth International Airport, Texas, for Nashville Metropolitan Airport, Tennessee. In addition to the passenger luggage in the midcargo compartment, flight 132 was loaded with a 104-pound fiber drum of textile treatment chemicals. Undeclared and improperly packaged hazardous materials inside the fiber drum included 5 gallons of hydrogen peroxide solution and 25 pounds of a sodium orthosilicate-based mixture. While in flight, a flight attendant and a deadheading first officer notified the cockpit crew of smoke in the passenger cabin. The passenger cabin floor above the cargo compartment was hot and soft, and the flight attendants had to move passengers from the affected area. The captain, who was aware of a mechanical discrepancy with the auxiliary power unit (APU) on an earlier flight which resulted in in-flight fumes, was skeptical about the flight attendant's report of smoke. No in-flight emergency was declared. After landing, the captain notified Nashville Ground Control about the possibility of fire in the cargo compartment, and he requested fire equipment. The flight attendants then initiated procedures to evacuate the airplane on the taxiway. About 2 minutes 8 seconds after the plane landed, the 120 passengers and 6 crewmembers began evacuating the airplane. After the plane was evacuated, crash/fire/rescue personnel extinguished the fire in the cargo compartment.¹

Following the accident, laboratory tests were conducted to determine the capability of materials shipped in the fiber drum and the consequences. The Safety Board concluded that the 5-gallon polyethylene drum packaged inside the fiber drum contained 50 percent strength hydrogen solution; that hydrogen peroxide solution leaked from the polyethylene drum before being loaded aboard flight 132 and again in flight while aboard flight 132; that a combination of the hydrogen peroxide solution, sodium orthosilicate-based mixture, and the previously wet fiber drum caused the in-flight fire in the midcargo compartment. In addition to proper

¹For more detailed information, read Hazardous Materials Incident Report--*In-Flight Fire, McDonnell Douglas DC-9-83, N569AA, Nashville Metropolitan Airport, Nashville, Tennessee, February 3, 1988* (NTSB/HZM-88/02)

packaging of hazardous materials, the safe transportation of hazardous materials depends on sufficient information to identify the materials and the hazards presented during transportation. Accordingly, both shippers and carriers have a responsibility to determine if materials offered for transportation are hazardous and are in proper condition to ensure their safe transportation. As the shipper, Textile Treatments International, Inc., not only failed to provide a proper description of the hazardous materials on the shipping paper, but it also failed to provide a description of the contents to American Airlines that would have alerted the carrier that the package contained hazardous materials. Both the hand-written and the typed shipping documents indicated that the shipper told the air carrier that the fiber drum contained laundry equipment, not chemicals. There is no factual evidence to support the shipper's contention that he told the freight clerk that the fiber drum contained laundry chemicals. Had he done so, the word "chemicals" should have alerted the air carrier to the possibility of hazardous materials.

American Airlines procedures for accepting packages that contain declared hazardous materials are thorough and include detailed checklist procedures to determine if hazardous materials shipments meet all safety requirements. While the National Transportation Safety Board is convinced that American Airlines would have rejected the fiber drum from Textile Treatments had it been identified correctly as containing hazardous materials, the Board believes that American Airlines procedures for accepting ordinary freight packages are not adequate. These procedures do not include routine inquiries about the possibility that hazardous materials may be included but not identified as such. Instead, freight clerks question customers about the possibility of hazardous materials only if an unusual circumstance, such as an odor, temperature differential, or leak, is detected, or if a shipping description clearly indicates that a package may contain hazardous materials.

Following this incident, American Airlines issued a freight services advisory to its freight service personnel to advise them that "commodities tendered for shipment that have a broad general description may contain dangerous goods which are not apparent," and it urged personnel to use logic and good common sense when accepting freight shipments. Included in the list of commodity descriptions are breathing apparatus, chemicals, cylinders, dental apparatus, electrical equipment, instruments, laboratory equipment, and pharmaceuticals. In addition to the advisory, the Safety Board urges American Airlines to develop checklist procedures and questions designed to help freight clerks to identify undeclared hazardous materials offered by general freight shippers who are unaware of Federal hazardous materials transportation safety regulations.

The Safety Board found no statistics to identify the total number of shipments offered for air transportation each year that were found to contain undeclared hazardous materials. However, by reviewing incident reports filed with the U.S. Department of Transportation (DOT), the Safety Board was able to identify hazardous materials incidents that involved undeclared hazardous materials. Between 1971 and March 1988, there were 2,260 hazardous materials incident reports involving air transportation filed with the DOT. Forty-two of these incidents resulted in two or more injuries or more than \$10,000 property damage; 22 of the 42 incidents involved undeclared hazardous materials. Additionally, a review of the DOT data for January 1980 through March 1988 disclosed that 1,091 reports were filed for air transportation incidents. Nine of the 1,091 incidents resulted in fires or explosions; 8 of the 9 fires or explosions involved undeclared hazardous materials.

One of these incidents was strikingly similar to the incident that occurred in Nashville, and it involved an undeclared shipment of hazardous materials for transportation through an air freight forwarder. The shipment involved 12 1-gallon containers of 35 percent hydrogen peroxide solution packaged in overpack containers. The hydrogen peroxide solution was also shipped for use in a demonstration, and no hazardous materials were declared on the shipping papers. Instead, the shipping papers described the contents of the packages as "ceiling cleaning solution and equipment." Furthermore, no hazardous materials markings or labels were affixed to the outside of overpacks to warn cargo handlers about the hazardous contents. The shipment originated in Pompano Beach, Florida, on October 31, 1986, and the destination was the Philippines. On November 6, 1986, in Seattle, Washington, cargo handlers found several packages in the shipment soaked with liquid and subsequently determined that 1 to 2 gallons of hydrogen peroxide had leaked from inner containers. Shipper representatives later said that they were unaware of hazardous materials transportation safety requirements when they offered the cargo to an air freight forwarder for transportation.

Industry also has recognized that undeclared hazardous materials present a problem. The International Air Transport Association dangerous goods regulations (Section 1.6.3) address precautionary measures against hidden hazards in cargo and baggage. It notes that experience has shown that shippers using some descriptions to declare the contents of their packages must be asked to check their consignments against the class definitions in the regulations and to confirm that the contents are not restricted.

Following a series of misdeclarations of freight, Swissair imposed new requirements on shippers who describe consignments in generic terms--shipping descriptions must include the phrase "not restricted." Unless the additional description is included with the shipping name, the cargo is assumed to contain hazardous materials.

While the DOT regulations require air passenger carriers to inform passengers about hazardous materials restrictions by posting a notice at locations where tickets are issued, baggage checked, and aircraft boarded, there are no requirements that notices be posted at freight counters where air cargo is offered to air carriers or to air freight forwarders. While American Airlines also posts this notice at freight counter locations, other passenger carriers and cargo-only carriers do not. However, even when the notices are posted, the Safety Board has found the warnings to be inadequate. DOT regulations require the notices to be "prominently displayed" and the lettering to be printed on a background of contrasting color. Instead, notices are often posted at the sides of passenger ticket counters or at other locations that do not readily attract the attention of the public, and they are usually printed in black and white. The notices do not use bright, multiple colors or illustrations to attract the public's attention. In a safety study on passenger safety education,² the Safety Board noted that the visual attractiveness of information materials is important if the message is to be noticed and then read. Therefore, the Safety Board believes that in order to increase the effectiveness of the warning notices, air carriers should improve the design, content, and posted location of hazardous materials restriction notices.

²Safety Study--Airline Passenger Safety Education: A Review of Methods Used to Present Safety Information (NTSB/SS-85/09)

The review of the cockpit voice recorder and crew interviews indicates that a deficiency in communication occurred between the cockpit and cabin crews during the in-flight fire and the descent into Nashville. An examination of the dialogue among crewmembers suggests that the captain was skeptical about the flight attendant's initial report of smoke. The first officer also appears to have been reluctant initially to accept that smoke, rather than fumes, was in the airplane.

Given the acknowledged seriousness of in-flight fire and the obvious association of a report of smoke in the cabin with a strong possibility of a fire, the Safety Board is deeply concerned by the captain's apparent reluctance to accept either the flight attendant's or deadheading crewmember's report as valid or to seek additional information to resolve his uncertainty.

In order to understand the captain's reaction, the Safety Board examined other circumstances that might have predisposed his behavior. Because the captain was aware of a mechanical discrepancy with the APU on an earlier flight which resulted in in-flight fumes, it would have been natural for this information to influence his perception of the initial report of smoke. However, the APU was not operating; therefore, the captain should have dismissed it as being the source of any fumes.

Further, with the flight only a few minutes away from landing, the captain was entering into a high activity level, and he had limited options available to deviate from the succession of events and activities already set in motion. That is, his current flight path, speed, and traffic sequence already was directed toward getting the airplane on the ground expeditiously, and he considered an expeditious landing the only immediate option available to alleviate this abnormal and ill-defined situation.

The Safety Board believes that these circumstances may have operated in concert to predispose the captain to disbelieve the reports of smoke, and to establish a mind set that the cabin crew was instead experiencing the less serious fumes.

The captain's skepticism about the report of smoke was also reflected in the first officer's dialogue with the cabin crew. His comments appear to be more of a challenge of the accuracy of the reports than an effort to get additional details. Even after he determined the problem in the cabin to be serious and after he recognized the need for timely firefighting assistance on landing, the first officer failed to aggressively recommend that crash/fire/rescue equipment meet the airplane.

On identifying smoke in the passenger cabin, a flight attendant recognized the potential seriousness of the problem and without hesitation, even under "sterile cockpit" conditions, immediately informed the first officer about the condition. Subsequent actions by the cabin crew, including efforts to locate the source of the fire, maintaining open communications with the cockpit, using a deadheading crewmember to evaluate and communicate information about the problem, and moving passengers from the affected area, also demonstrated that they considered the problem to be serious.

The Safety Board believes that while it is unlikely that the captain could have taken any action to land the plane more quickly, the cockpit crew failed to use the cabin crew effectively to obtain an accurate understanding of the developing problem. Had communications between the cockpit crew and the cabin crew been more effective, the Safety Board believes that the captain would have called for fire/rescue equipment to meet the airplane and ordered an emergency evacuation on

the runway. The Safety Board believes that American Airlines should use this example in cockpit and cabin crew coordination training to illustrate the need for cockpit crews to more effectively use cabin crews in describing suspected in-flight safety problems and to emphasize the need for cabin crews to be assertive when communicating information about safety problems to cockpit crews.

The lethal threat of smoke and fire in aircraft to passenger safety and the need to remove passengers from that environment quickly is well acknowledged. Because the captain failed to order an emergency evacuation of the airplane until 2 minutes 8 seconds after touchdown, the passengers were unnecessarily exposed to these threats for about 1 1/2 minutes longer than necessary.

The captain's delayed decision also increased the time necessary to evacuate the airplane; therefore, flight attendants did not have time to use the public address system to prepare passengers for a quick exit or to provide clear, oral instructions to passengers on evacuation procedures. Consequently, while most passengers considered the evacuation orderly, some complained that they could not hear commands shouted by the flight attendants until they were near the exits. As a result, the evacuation was delayed when passengers were stopped at exits to remove their shoes and to discard their carry-on luggage. The delayed decision to evacuate also prevented crash/fire/rescue personnel from being in place to assist in the evacuation and to protect passengers should the fire have broken through to the cabin.

The Safety Board concluded that the actions of the flight attendants were performed in accordance with American Airlines training and procedures. The Safety Board noted that American Airlines emergency procedures require flight attendants to instruct passengers to remove shoes, while passenger safety information cards provide no similar instructions. The Safety Board believes that the communication of emergency evacuation procedures to passengers could be improved if American Airlines operational procedures, manuals, training, the flight attendants' oral instructions, and passenger safety information cards provide consistent instructions to passengers regarding the removal of shoes.

After the airplane was evacuated, actions taken by American Airlines ground personnel, although well intended, could have resulted in the destruction of the airplane or the loss of lives. By opening the doors to cargo compartments suspected to contain fires without having the appropriate firefighting equipment available, ground personnel may compromise cargo compartment fire safety systems, supply oxygen to fires, and cause fires to spread or intensify. Ground personnel who are expected to respond to an aircraft when a fire is suspected should be trained on the appropriate actions to be taken. Further, airline personnel should be instructed not to board aircraft to collect the passengers' carry-on luggage until the aircraft has been declared safe by fire personnel.

Therefore, the National Transportation Safety Board recommends that American Airlines:

Revise procedures for accepting general freight packages for transportation to include questions developed to aid in identifying hazardous materials in packages that are not declared by shippers.
(Class II, Priority Action) (A-88-115)

Improve the design, content, and posted location of hazardous materials restriction notices to attract the attention of passengers and shippers and to increase the effectiveness of the warning notice. (Class II, Priority Action) (A-88-116)

Review and modify as needed training programs to require joint cockpit and cabin crew training with respect to emergency procedures; specific attention should be given to conducting periodic emergency drills in which cockpit/cabin crew coordination and communication are practiced. (Class II, Priority Action) (A-88-117)

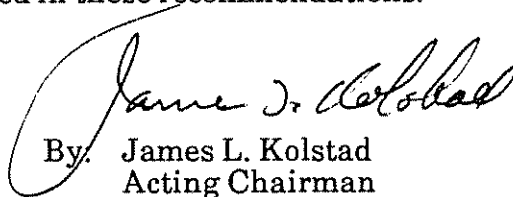
Amend, as appropriate, operational procedures, manuals, training, flight attendants' oral instructions, and passenger safety cards to provide consistent instructions to passengers on emergency evacuation actions. (Class II, Priority Action) (A-88-118)

Train ground personnel who respond to aircraft emergencies on the proper procedures to be taken when aircraft fires are suspected. (Class II, Priority Action) (A-88-119)

Also, as a result of its investigation, the Safety Board issued Safety Recommendation A-88-120 to the Research and Special Programs Administration; A-88-121 through -128 to the Federal Aviation Administration; A-88-129 to the Air Transport Association of America; and I-88-7 to the Textile Treatments International, Inc.

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "... to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations A-88-115 through -119 in your reply.

KOLSTAD, Acting Chairman, and BURNETT, LAUBER, NALL, and DICKINSON, Members, concurred in these recommendations.


By. James L. Kolstad
Acting Chairman