

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

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(202) 426-8787

ISSUED: June 10, 1976

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Forwarded to:

Honorable John L. McLucas  
Administrator  
Federal Aviation Administration  
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-76-80 and 81

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On November 12, 1975, an Eastern Air Lines Boeing 727 crashed short of the runway at Raleigh-Durham Airport, Raleigh, North Carolina. 1/ The National Transportation Safety Board's investigation of that accident has disclosed that the restraint system of the forward flight attendant's jumpseat, as installed, can contribute to unnecessary injuries to flight attendants during in-flight turbulence or during crash landings.

Investigation disclosed that the seatbelt tiedown rings on the forward bulkhead are installed far enough above the seatpan that, when the belt is worn, little or no angle exists between the seatbelt and the seatpan. Consequently, the seatbelt passes across the soft tissues of the abdomen, instead of passing across the medial and anterior aspects of the pelvic girdle.

According to information supplied by the Armed Forces Institute of Pathology (AFIP), a seatbelt that is worn higher than the hips may cause the pelvis to rotate when the body is subjected to longitudinal and vertical loads, especially when the seatpan cushion is not firm. When the lower torso rotates, or "submarines," beneath the seatbelt, the soft abdominal viscera are exposed to the seatbelt loads. To prevent this exposure, a seatbelt should be installed to provide an angle of 45° to 55° with the seatpan. This method of seatbelt positioning is recommended in the U. S. Army's Crash Survival Design Guide (USAAMRDL Technical Report 71-22).

1/For more detailed information on this accident, read "Aircraft Accident Report: Eastern Air Lines, Inc. Boeing 727-225, N8838E, Raleigh, North Carolina, November 12, 1975 (AAR-76-15)."

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FAA's Civil Aeromedical Institute (CAMI) in Oklahoma City also has warned of the potential dangers of mispositioned seatbelts. A properly positioned seatbelt will stabilize the lower torso and will assure that the decelerative forces are applied to the bony structure of the pelvis instead of to the vulnerable viscera in the abdomen. The fact that the B-727 forward jumpseat is aft-facing does not negate the necessity for a properly positioned seatbelt because injury can occur equally from longitudinal decelerations and from lateral, roll-over, and rebound forces.

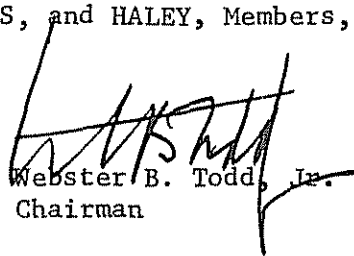
The AFIP reported that typical injuries which can result from mispositioned seatbelts include lacerations of intestines, mesentery, pancreas, stomach, liver, and major arteries and veins. These injuries can be further aggravated when the seatbelt buckle compresses the abdominal organs against the vertebral column. Also, "submarining" causes flexion of the spine and increases the probability of vertebral fractures. CAMI has cited diagnostic difficulties as the dangerous aspects of internal injuries, since their symptoms are sometimes overlooked or discounted as indicators of a severe intra-abdominal injury.

The Safety Board has learned that similarly mispositioned seatbelts are also installed on flight attendant seats in Douglas DC-8 and DC-9 aircraft, and on Boeing 707 aircraft; the Safety Board is equally concerned about the potential hazard to jumpseat occupants in these aircraft.

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

1. Issue an Airworthiness Directive to require that the seatbelt tiedown rings on all Boeing 727 forward jumpseats be relocated so that the seatbelt will be positioned across the occupant's pelvic girdle at the recommended angle with the seatpan of 45° to 55°. (Class II - Priority followup)
2. Inspect the flight attendant jumpseats on all other air carrier aircraft to insure that the seatbelt tiedowns are positioned properly; where improper installations are found, take immediate action to require that the tiedowns be relocated. (Class II - Priority followup)

TODD, Chairman, McADAMS, HOGUE, BURGESS, and HALEY, Members,  
concurred in the above recommendations.

  
By: Webster B. Todd, Jr.  
Chairman

THESE RECOMMENDATIONS WILL BE RELEASED TO THE PUBLIC ON THE ISSUE  
DATE SHOWN ABOVE. NO PUBLIC DISSEMINATION OF THIS DOCUMENT SHOULD BE  
MADE PRIOR TO THAT DATE.