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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Log 2230

Date: May 4, 1990

In reply refer to: A-90-54 thru -61

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

On February 23, 1988, a Boeing 747-122 operated by United Airlines as flight 811 departed Los Angeles, California, as a scheduled flight to Sydney, Australia, with en route stops at Honolulu, Hawaii, and Auckland, New Zealand. The flight departed Honolulu at 0155 on February 24, 1988, with 3 flight crewmembers, 15 cabin attendants, and 337 passengers. About 20 minutes into the flight, and near 23,000 feet, a rapid decompression occurred when the forward starboard cargo door separated from part of the cabin fuselage. The airplane returned to Honolulu International Airport, landing safely on runway 8L at 0234 where an emergency evacuation was conducted. Of the 355 occupants on board when the flight departed Honolulu, 9 were lost during the decompression; and 1 crewmember, 15 flight attendants, and 22 passengers were injured during the decompression and emergency evacuation.

Before the emergency landing at Honolulu, the flightcrew requested that all available rescue and medical equipment be on hand when they landed.

Flight attendants had about 20 minutes to prepare the cabin and the passengers for evacuation; they did not know how much time was available however, and prepared first for an imminent ocean ditching. They accomplished the following tasks: attended to injured flight attendants and passengers; attached the face masks to their emergency oxygen bottles; helped each other don life preservers; helped many passengers don their perservers; held up safety cards and life vests to call attention to these items for passengers to use; briefed "helper" passengers to assist in the evacuation; cleared debris away from the exit doors and aisles; closed the doors of the storage compartment over doors 2 left and 2 right, which had opened during decompression; prepared the cabin for emergency evacuation; and told the passengers to brace for impact.

The Safety Board's investigation of the accident revealed several problems experienced by the flight attendants and passengers while preparing for a possible ditching and for the emergency evacuation. The problems included difficulties experienced by flight attendants when connecting face masks to their portable oxygen bottles, inconvenient location of an oxygen bottle, insufficient number of megaphones, limited visibility from a flight

attendant seat, opening of overhead storage compartment doors, stored luggage in overhead compartments at exit doors, and difficulties with donning and properly fastening life preservers.

Portable Oxygen Bottles

The decompression occurred at about 23,000 feet and caused the complete loss of the supplemental oxygen systems for the crew and passengers. Flight attendants had to use portable emergency oxygen bottles; some of the attendants had difficulty attaching the mask to the oxygen bottle's regulator because they were hypoxic and excited, and because they had trouble aligning the fittings to the regulator. Federal Aviation Regulation 14 CFR 25.1447 (c)(4) requires that "portable oxygen equipment must be immediately available for each cabin attendant." Although the portable oxygen bottles were available, they were not immediately usable because the masks were not attached to the regulators.

Had the masks been attached to the emergency oxygen bottles, the attendants would have had oxygen quickly and would not have been detained from providing assistance to the passengers. Flight attendants are vital to the safety and survival of the passengers; safety improvements should be made to help ensure that flight attendants do not become incapacitated. Therefore, the Safety Board believes the Federal Aviation Administration (FAA) should amend regulations to require that oxygen masks be attached to the regulators on portable oxygen bottles.

Location of Oxygen Bottles

The aft purser ran back to the flight attendant jumpseat at exit door 5 left, believing an oxygen bottle would be located there. She described her experience as follows: "...I didn't know that there was not an oxygen bottle back at 5 left. I looked all over and I didn't see a bottle, so I just ran back to 4 left. By the time I got there I was really light-headed." When she reached the jumpseat at 4 left, another flight attendant--who was already sitting there--placed an oxygen mask on the purser's face. In reflecting on her experience, the aft purser further stated, "considering...there was no other available source of oxygen, you can't imagine how horrible I felt going back there needing oxygen but finding no oxygen bottle at 5L. It was terrifying."

A portable oxygen bottle was not stowed at either door 5 right or at door 5 left, although a flight attendant seat was located at each door. One oxygen bottle was stowed, as required by United Airlines, in the aft right coat closet behind the flight attendant seat at door 5 right. No oxygen bottle was stowed in the aft left closet behind the flight attendant seat at door 5 left, nor was one required by United Airlines. The closet and lavatories on the left side were physically separated from those on the right. An attendant seated at door 5 left would therefore have to walk around to the right side of the airplane to retrieve the oxygen bottle in the aft right closet. Furthermore, if the flight attendant at door 5 right had retrieved the oxygen bottle, an oxygen bottle would not have been available for the attendant from door 5 left. Stowage of one portable oxygen bottle in

the aft right closet is inadequate for use by two attendants and is not immediately available as required by 14 CFR 25.1447 (c)(4). The Safety Board therefore believes that an oxygen bottle, with mask attached, should be located at the flight attendant seats at door 5 left and at door 5 right.

Megaphones

Communication between the flight attendants and passengers was difficult because of the high ambient noise level in the cabin after the decompression. Flight attendants were located at each of the 10 exit doors, yet only 2 megaphones were required to be on the airplane: at doors 1 left and 4 left.

These megaphones were used by the two flight attendants responsible for the doors. They shouted commands over the megaphones to passengers in their immediate areas and to the other flight attendants in preparation for the landing and subsequent evacuation. The other 13 flight attendants (and 1 who was not on duty but traveling to his next assignment) had to shout, use hand signals, and hold up the passenger safety card, which contained information about putting on life preservers and preparing for evacuation.

The use of a megaphone was even more important in this accident because of a perceived lack of communication over the public address (PA) system. The Safety Board's investigation determined that the PA system was operational. The chief purser, at door 1 left, made the announcement over the PA system, "Prepare for emergency landing; brace." The noise was so loud in the cabin that she did not know if the announcement was heard in the rear cabins, so she stopped using the PA. The aft purser attempted to use the PA system, but "nothing happened"; she obtained one of the two megaphones and quickly took her seat because she thought the landing was imminent.

At present, 14 CFR 121.309 (f)(1) requires one megaphone on each airplane with a seating capacity of 60-99 passengers; 14 CFR 121.309 (f)(2) requires two megaphones in the cabins on each airplane with a seating capacity of 100 passengers and more. The Safety Board believes the regulations should be amended to provide for a megaphone at each row at which flight attendants are stationed.

Visibility from Upper Deck Flight Attendant Jumpseat

Immediately after the decompression, the flight attendant in the upper deck business class section went to her jumpseat and donned her restraint system, oxygen mask, and life preserver. While she waited for instructions and because of intense cabin noise, she had to communicate with passengers by holding up a safety card and a life preserver. Passengers sitting in the front rows, in turn, showed safety cards and life preservers to passengers seated behind them. Eventually the passengers got the idea they were to read the safety card and don their preservers. During postaccident interviews, the flight attendant stated that her jumpseat was so low she could not directly observe the passengers in the fourth row or beyond and "...had to assume that they (the passengers) were okay...."

Title 14 CFR 25.785 (h)(1) states the following:

To the extent possible without compromising their proximity to required floor level emergency exits, flight attendants seats must be located to provide a direct view of the cabin area for which the flight attendant is individually responsible for.

The flight attendant in the business class section was 5 feet 3 1/2 (63 1/2) inches tall; for a 10th percentile subject 63.01 inches tall, the sitting eye height is about 28.54 inches.¹ Because the flight attendant did not have direct visibility to the entire cabin, the Safety Board believes the FAA should examine the visibility of cabin areas from the upper deck flight attendant seats on B-747 airplanes and take necessary appropriate action to ensure that 10th percentile subjects can observe the entire cabin.

Overhead Storage Compartment

A two-door overhead storage compartment, formerly used to store a liferaft, was located above each exit door. These compartments contained blankets and passenger carry-on luggage. When the cabin structure separated, the doors of each overhead compartment had opened above exit doors 2 left and 2 right, dropped down, and blocked each exit. Also, the contents of the compartments fell to the floor at the exits and could have hindered expeditious use of these exits had an emergency evacuation been imminent. Had there been a fire, an evacuation, or a water ditching, rapid egress would have been delayed. The Safety Board does not believe luggage should be stored in these compartments. Furthermore, these compartment doors could open during a hard landing or turbulence, swinging down and injuring a flight attendant. Thus, the Safety Board believes improved latches should be installed on these overhead compartment doors to prevent their inadvertent opening, and their downward movement should be restricted so that the doors do not strike a seated flight attendant or block the exit door.

Life Preservers

The chief purser was unable to tighten the life preserver's two straps around her waist and needed another flight attendant to tighten them for her. Several other flight attendants and passengers had difficulty connecting the two straps around their waists. One flight attendant helped about 36 passengers don their preservers.

Safety Board investigators and United Airlines personnel examined different types of life preservers, produced by five manufacturers, that were onboard the airplane. The straps on a preserver of one manufacturer were very difficult to tighten around the waist while those on another type from the same manufacturer were easy to tighten; the two vests had different strap material and strap adjustment hardware. Also, the straps on preservers from the five manufacturers were very difficult, if not impossible, to tighten

¹U.S. Department of Transportation, Federal Aviation Administration. 1975. Anthropometry of airline stewardesses. FAA-AM-75-2. Washington, D.C.

when they were pulled at an acute angle (from about 45° to 70°) from the wearer's body. The straps were easier to adjust when the hands and straps were held closer to the waist. The Safety Board believes the straps and adjustment fittings on aircraft life preservers need to be evaluated to ensure that straps can be tightened irrespective of the angles at which they may be pulled.

The FAA prescribes the minimum performance standards for life preservers in Technical Standard Order TSO-C13d (dated January 3, 1983):

Donning. It must be demonstrated that an adult, after receiving only the customary preflight briefing on the use of life preservers, can don the life preserver within 15 seconds unassisted while seated. It must be demonstrated that an adult can install the life preserver on another adult, a child, or an infant within 30 seconds unassisted. The donning demonstration is begun with the unpackaged life preserver in hand.

Postaccident interviews with flight attendants and information obtained during the investigation indicated that, for many occupants, donning life preservers required more time than the 15 seconds and 30 seconds specified in TSO-C13d.

In 1985, the Safety Board issued Safety Recommendations A-85-35 through -37 to the FAA that asked for improvements in the instructions, procedures and time demonstrated for donning life preservers.² In response, FAA proposed rulemaking to revise TSO-C13e. The revision will require that life preservers be designed so the wearer can secure and fully adjust the life preserver with no more than one attachment and no more than one adjustment for fit. The revision will also require donning tests by age groups of users, beginning with 20-29 years and ending with 60-69 years. At least 60 percent of the test subjects in each age group must be able to don their life preserver within 25 seconds unassisted and with their seatbelts fastened, starting with the life preserver in its storage package. The revised requirements in TSO-C13e would have eliminated some of the problems experienced by passengers on flight 811 when they attempted to don and adjust their life preservers.

In A-85-35 through -37, the Safety Board also recommended that the FAA require air carriers to install the improved life preservers within a reasonable time. The FAA adopted the revision of TSO-C13e on April 23, 1986, and specified a cutoff date of April 23, 1988, after which air carriers were required to have on board life preservers that met the requirements of the revised TSO-C13e. The objective of the cutoff date was to allow the air carriers time to introduce life preservers manufactured to

²National Transportation Safety Board. 1985. Safety Study: Air carrier overwater emergency equipment and procedures. NTSB/SS-85-02. Washington, DC. 23 p.

the higher standards into their fleets. On March 3, 1988, however, the FAA rescinded the cutoff date to seek further public comments of fleet retrofit in accordance with the proposed rulemaking.

In a letter to the FAA, dated November 28, 1988, the Safety Board recommended that a cutoff date of January 1, 1989, be reestablished. Based on the circumstances of flight 811, the Safety Board again urges the FAA to establish a cutoff date after which air carriers would be required to carry life preservers that meet the higher performance standards specified by TSO-C13e that was adopted on April 23, 1986.

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

Amend 14 CFR 1447 (c)(4) to require that face masks be attached to the regulators of portable emergency oxygen bottles. (Class II, Priority Action) (A-90-54)

Require, in accordance with the requirements of 14 CFR 25 1447 (c)(4), that a portable oxygen bottle be located at the flight attendant stations at exit door 5 right and at exit door 5 left in B-747 airplanes. (Class II, Priority Action) (A-90-55)

Require that no articles be placed in storage compartments that are located over emergency exit doors. (Class II, Priority Action) (A-90-56)

Amend 14 CFR 121.309 (f) to require a readily accessible megaphone at each seat row at which a flight attendant is stationed. (Class II, Priority Action) (A-90-57)

Take corrective action to improve direct visibility to passengers from the upper level flight attendant jumpseat in the B-747 airplanes using eye reference data contained in Federal Aviation Administration report FAA-AM-75-2 "Anthropometry of Airline Stewardesses." (Class II, Priority Action) (A-90-58)

Issue an Airworthiness Directive to require that stronger latches be installed in oversized storage compartments that formally held liferafts on all B-747 airplanes and also limit the distance that these compartments can be opened. (Class II, Priority Action) (A-90-59)

Demonstrate for each make and model of life preserver that it can be donned, adjusted, and tightened within the elapsed time required by TSO-13d. Direct particular attention to the ease with which straps pass through adjustment fittings when the straps are pulled at all possible angles. (Class II, Priority Action) (A-90-60)

Establish a cutoff date of within 1 year of this recommendation after which all life preservers manufactured for passenger-carrying aircraft would be required to meet the specifications of TSO-C13e. (Class II, Priority Action) (A-90-61)

Also as a result of this accident, the National Transportation Safety Board reiterates the following recommendations to the Federal Aviation Administration:

A-85-35

Amend 14 CFR 121 to require that all passenger-carrying air carrier aircraft operating under this Part be equipped with approved life preservers meeting the requirements of the most current revision of TSO-C13 within a reasonable time after the adoption of the current revision of the TSO; ensure that 14 CFR 25 is consistent with the amendments to Part 121. (Class II, Priority Action)

A-85-36

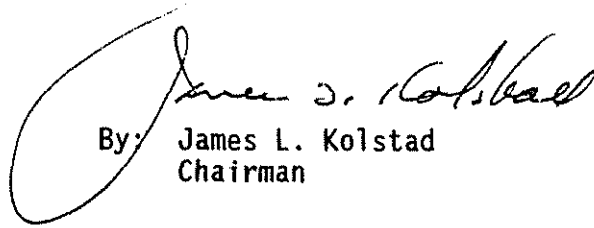
Amend 14 CFR 125 to require that all passenger-carrying air carrier aircraft operating under this Part be equipped with approved life preservers meeting the requirements of the most current revision of TSO-C13 within a reasonable time after the adoption of the current revision of the TSO; amend Part 125 to require approved flotation-type seat cushions (TSO-C72) on all such aircraft; ensure that 14 CFR 25 is consistent with the amendments of Part 125. (Class II, Priority Action)³

A-85-37

Amend 14 CFR 135 to require that all passenger-carrying air carrier aircraft operating under this Part be equipped with approved life preservers meeting the requirements of the most current revision of TSO-C13 within a reasonable time after the adoption of the current revision of the TSO; amend Part 135 to require approved flotation-type seat cushions (TSO-C72) on all such aircraft; ensure that 14 CFR SFAR No. 23 is consistent with the amendments to Part 135. (Class II, Priority Action)

³The Safety Board recognizes that the FAA has complied with part of this recommendation pertaining to the flotation-type seat cushions.

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


By: James L. Kolstad
Chairman