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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 12, 1992

In reply refer to: A-92-66 through -78

Honorable Thomas C. Richards
Administrator
Federal Aviation Administration
Washington, D.C. 20591

In several recent accident investigations, the Safety Board found that although flight attendants provided valuable assistance to passengers during emergency situations, they did not always follow their air carrier's approved emergency procedures or perform their duties in accordance with training. The Safety Board reviewed its investigations of accidents and incidents where information was available on flight attendant performance during emergency situations. There were many examples of flight attendants who have performed extremely well, even heroically, during life-threatening emergencies and who were responsible for preventing and/or minimizing injuries to passengers. Nonetheless, there have been many examples of flight attendants who lacked knowledge about emergency equipment and procedures, or who acted otherwise contrary to their training. In 2 of the 24 evacuation cases cited in this report¹, the actions of some flight attendants contributed to an increase in the number of passenger injuries. In some of the other cases, flight attendant actions came very close to increasing the number of injuries. The Safety Board is concerned that these same actions in other situations could have disastrous results and that flight attendant training may not adequately prepare flight attendants for actions that they may be required to take.

The Federal Aviation Administration (FAA) requires flight attendants to be aboard passenger-carrying airplanes with more than nine seats that operate under the Federal Aviation Regulations (FARs) found at 14 Code of Federal Regulations CFR 121. Air carriers must have FAA-approved training programs that provide specific programmed hours for selected subjects, and flight attendants must maintain their proficiency and attend recurrent training each year. The purpose of emergency procedures training is to ensure that flight attendants have the knowledge, skills and ability to react properly during emergency situations. The Safety Board strongly believes that the ability of

¹ For more detailed information, read Special Investigation Report- "Flight Attendant Training and Performance During Emergency Situations." (NTSB/SIR-92/02)

flight attendants to perform their duties successfully during emergency situations is directly related to the quality of their emergency training.

During its special investigation, the Safety Board reviewed the FAA-approved training programs of twelve Part 121 operators. It includes operators of both domestic and international flights, operating from one to seven types of airplanes and employing from 850 to 1800 flight attendants who were qualified on as many as seven types of airplanes.

Initial training is by far the most extensive training given to flight attendants. The length of this training, which qualifies flight attendants on as many as seven types of airplanes, varied from 4 weeks to 6 weeks. Ten operators conducted initial training on all types of airplanes in their fleets; one operator qualified new flight attendants on five of its seven airplane types; and another operator qualified new flight attendants on two of its five airplane types.

The FARs specify a minimum of 12 hours of recurrent emergency procedures training and a minimum of 4 hours of recurrent security training. The FARs also have provisions for operators to seek FAA approval to reduce these hours. Only one air carrier, which operated three types of airplanes, conducted the specified 16 hours of training. The other operators had waivers to conduct recurrent training programs in less than 16 hours. Another air carrier operated six types of airplanes and conducted a 6-hour recurrent emergency training program, or 50 percent of the hours required by the FARs. One operator's recurrent emergency training program was approved for 5 1/2 hours, but it conducted an 8-hour class, as well as a 2-hour recurrent security training class, for a total of 10 hours.

Crewmember Emergency Training (14 CFR Section 121.417) must provide "instruction in emergency assignments and procedures, including coordination among crewmembers." Some hands-on operational exercises are required of flight attendants during initial training and once each 24 calendar months during recurrent training for each type of aircraft in which they are to serve. One of the required drills is to operate each type of exit in the normal and emergency mode during initial and recurrent training. An evacuation drill is required once during initial training.

Many differences in operator procedures were noted when door opening drills were conducted. Some operators conduct proficiency tests on each exit that flight attendants are qualified to operate, while other operators require flight attendants to operate each exit but only conduct a proficiency test on one exit. All of the operators conducted hands-on door drills at least every 24 months, as required by the FARs, but four operators exceeded the FAR requirements and conducted hands-on drills to open exits (for all the airplanes for which a flight attendant is qualified) every 12 months. Many air carriers do not perform evacuation drills during recurrent training. Differences were noted in the number of hours approved for recurrent training, types of drills, instructor/student ratio during drills, and methods of assessing proficiency.

The instructor/student ratio during drills among the airlines ranged from a high of 1:9 to a low of 1:1. During a visit to one operator, Safety Board staff observed a drill in which a flight attendant attempted to open a door using the arm/disarm lever rather than the door operating handle. The student subsequently operated the proper handle, and the door opened. The improper action was apparently not observed by the instructor (who was observing four students during the drill), and the flight attendant was not asked to repeat the drill. Safety Board staff noted that another operator's door opening drills required an instructor to observe each student individually to ensure that every step on a checklist was accomplished in order to successfully complete the drill.

In September 1985, the FAA held a Public Technical Conference on the Emergency Evacuation of Transport Airplanes. As a result of the conference, a working group was formed on Training and Operations. The working group requested that the FAA issue an Advisory Circular (AC) on flight attendant training. The FAA issued a proposed AC, "Crewmember Cabin Safety Training," on November 20, 1987, with guidance on acceptable ways to develop flight attendant training programs. The proposed AC would clarify areas in which standardization in flight attendant recurrent training programs does not exist.

The Safety Board is concerned that nearly 5 years have elapsed since the AC on flight attendant training was proposed and that the FAA has not yet issued a final AC. The lack of guidance is detrimental to Principal Operations Inspectors' (POI) ability to review and approve the program, as well as the air carriers ability to develop training programs. Therefore, the Safety Board strongly urges the FAA to update the AC and expedite its issuance. As a result of this special investigation, the Safety Board believes that the AC should more clearly define the type of training described in the proposed AC as "exceptional, time-saving, and effective training techniques, such as separate mockups for each aircraft type and model," which allows operators to reduce the 12-hour requirement for recurrent training. Further, the Safety Board believes that the FAA should provide specific guidance on whether cabin mockups and exit mockups are equally weighted in granting a reduction in hours. The AC should also give specific guidance for granting waivers for reduced hours for recurrent training.

POIs approve training programs and grant waivers for reductions in training hours. The latest version of the Air Carrier Operations Inspector's Handbook (FAA Order 8400.10), which provides guidance to POIs on approving training programs, is currently being revised. Order 8400.10 Chg. 4, Chapter 14, Flight Attendant Training and Qualification Programs, dated August 31, 1990, provides "direction and guidance to FAA personnel responsible for the evaluation and approval of flight attendant training curriculums." Chapter 14 currently provides guidance for approval of Basic Indoctrination Training and General Emergency Training, but the section of Chapter 14 with guidance for Recurrent Training has not yet been issued. The previous handbook, FAA Order 8430.6C, issued on July 2, 1984, did not have a section on the approval of flight attendant training programs.

The Safety Board's 1974 special study "Safety Aspects of Emergency Evacuations from Air Carrier Aircraft,"² cited examples of inappropriate performance resulting from inadequate knowledge of emergency equipment and procedures. The study concluded that the adequacy of emergency training can be measured indirectly by analyzing crewmember performance during actual emergencies.

This investigation of flight attendant performance during actual emergencies has revealed that although improvements in training have been made since the 1974 study, training issues continue to be of concern. Some flight attendants did not demonstrate proficiency in their knowledge of exit operations, evacuation slide or slide/raft inflation and disconnection, location of equipment, knowledge of chemically generated oxygen systems, use of checklists during an emergency, crew communication, and ability to follow established or standard operating procedures. In some accidents, it is apparent that the flight attendants intended to take the proper action, such as inflating or disconnecting the slide or slide/raft, but took incorrect action, such as pulling the wrong handle. The Safety Board is concerned that these flight attendants did not have adequate knowledge of the operation of the evacuation slides.

Two accidents in this special investigation that disclosed problems with inadvertent disarming of emergency exits were: the DC-10 in Los Angeles, California, in 1978, and the DC-10 in San Juan, Puerto Rico, in 1985. The arm/disarm lever and the door control handle are adjacent to each other. Upward movement on the arm/disarm lever disarms the exit and upward movement on the door control handle opens the door. Flight attendants do not normally have the opportunity to develop strong habit patterns associated with operating the door control handle because each door is not always opened, and doors are usually opened by ground service personnel from outside the airplane. However, flight attendants develop strong arm and disarm habit patterns because they regularly use the "arm/disarm" lever during taxi to and from the gates. The Safety Board believes that more emphasis should be placed upon the operation of this type of DC-10 door (or other doors with similar designs) to overcome this design-induced difficulty. Since the operating systems on some doors may predispose operators to human error, flight attendant training should emphasize the potential for error and should reinforce the need for the correct action.³ There is a need for improved human engineering design of cabin safety equipment such as the door controls described above. The FAA should amend the FARs to include ergonomic design requirements.

Three accidents demonstrated that some flight attendants were unsure of, or could not recall without assistance, the location of emergency equipment. In two accidents, the flight attendants reacted immediately to

² Special Study, November 13, 1974 (NTSB AAS-74-03)

³ Wiener, Earl and Nagel, David, Human Factors in Aviation, Harcourt Brace Jovanovich, San Diego, 1988, CH. 15 "Cockpit-Crew Systems Design and Integration," Sexton, George.

the situations and sought, but could not find, the needed equipment. The Safety Board believes that each operator should strive for the standardization of equipment location in order to facilitate flight attendant recall of emergency equipment location. There are significant differences in the location and operation of emergency equipment and exits among airplanes operated in most operators' fleets. Flight attendants should know where emergency equipment is located in airplane cabins. Their knowledge of equipment location should not be restricted to areas where they are assigned or have preflighted. The stress of an emergency situation, and the infrequent use of emergency equipment, may cause a flight attendant to become confused about the location of equipment. Therefore, the more aircraft types for which flight attendants are qualified, the greater the need for standardized equipment location within aircraft types and the more stringent the training, testing, and proficiency drills should be to ensure that no confusion exists about the location and operation of emergency equipment.

In its 1976 special study on "Chemically Generated Supplemental Oxygen Systems in the DC-10 and L-1011,"⁴ the Safety Board noted that passengers and flight attendants had erroneously concluded that oxygen was not flowing to masks because the reservoir bag attached to each mask did not inflate and because there was no other indication that oxygen was flowing. Although visual indicators on rebreather bags now make it easy to identify the flow of oxygen, some flight attendants were not trained to use these indicators. In two DC-10 decompressions a green band on the reservoir bags showed that oxygen was flowing, but flight attendants were not trained on the purpose of the green band. In these decompressions, flight attendants used fire extinguishers on some oxygen compartments because passengers were alarmed that the compartments were generating smoke. The FAA should ensure that flight attendant training programs include information on visual oxygen flow indicators and the probability of oxygen generators producing smoke.

Following an accident or an emergency situation, flight attendants need information to assist them in evaluating risks to themselves and passengers. For example, many flight attendants stated that they thought the airplane was about to "explode" or "blow up." While flight attendant training should not minimize potential hazards, it should provide information about the greatest risks following an accident. Accident history reveals that explosions rarely occur and that the greatest risks are fire and toxic smoke. The Safety Board believes that flight attendants who understand these risks during emergencies will be better prepared to make decisions about passenger safety and their own safety.

Accident investigations strongly indicate that, in some instances, flight attendants were knowledgeable about, but not proficient in, performing their duties. Based on accident history, the Safety Board is concerned that some air carrier methods of determining proficiency may be inadequate. The FAA should ensure that flight attendant recurrent training

⁴ Special Study: Chemically Generated Supplemental Oxygen Systems in DC-10 and L-1011 Aircraft (NTSB-AAS-76-1).

programs include comprehensive testing of the knowledge and skills needed during emergencies. Further, the training and testing should account for performance degradation under stress.

Although all operators conducted exit-opening drills at least every 24 months, not all operators conducted evacuation drills during recurrent training. The Safety Board believes that since training is the only opportunity to practice their skills outside of an emergency context, flight attendants should demonstrate proficiency in the operation of each exit they may be expected to operate. Flight attendants should also demonstrate proficiency in the use of verbal commands to manage passenger flow when competitive behavior is displayed. There are several airplanes in which flight attendants are responsible for opening more than one exit, but most recurrent training programs do not require flight attendants to practice opening more than one exit during drills. Flight attendants who are responsible for opening more than one floor-level exit, or a combination of floor-level exits and exit hatches, during emergency evacuations, should demonstrate proficiency in methods they will use to open these exits, including managing the flow of passengers. Flight attendants who do not have opportunities to practice such skills may not be able to perform the appropriate emergency procedures in a timely manner when emergencies occur.

The Safety Board believes that the FAA should require evacuation drills and group exercises during recurrent training. These exercises are important in learning to perform and communicate as a team, gaining experience in situational awareness, and acquiring experience working with passengers. Recurrent training should include exercises with exits blocked, exits inoperable, and/or for which flight attendants need assistance to open the exit. During these drills, it is also important that flight attendants who use improper procedures or take incorrect actions immediately receive remedial instruction.

The Safety Board strongly endorses joint cockpit/cabin emergency training. Many of the concepts in cockpit resource management (CRM) programs should be included in flight attendant training. A CRM approach to flight attendant training could stress the need to communicate completely and accurately and ensure that there is a complete communication loop; help assure that tasks are prioritized and delegated; and help assure that task focus is transitioned to the task that is appropriate for the situation. With the proliferation of two-person cockpit crews, the Safety Board believes that emergency training should jointly involve both cockpit and cabin crews, in order to develop and practice skills as a team.

Written examinations that are given during recurrent training should be comprehensive, and, where flight attendants are qualified on numerous types of airplanes, the examinations should be comprehensive enough to ensure that flight attendants are equally knowledgeable about aircraft-specific subjects, such as the location of emergency equipment, communication systems, slide/raft deployment and exit operation. Examinations should also thoroughly cover all of the general emergency subjects, such as decompressions, evacuations, ditchings, first aid, flotation equipment, fire fighting, portable oxygen containers, crew communication, and security.

In addition, many operators are conducting fewer hours of training. Because of these circumstances, the Safety Board believes that the FAA should review human factors research on the ability of flight attendants to retain knowledge and skills that are critical in an emergency. This research could provide valuable information to evaluate the adequacy of flight attendant training program approval.

The Safety Board has concluded that guidance to FAA inspectors approving flight attendant training programs is long overdue. The Safety Board believes that the FAA is inconsistent in its process by which POIs approve flight attendant training programs and that it is regulating by waiver rather than by adherence to the FARs. Apparently, the FAA grants waivers for recurrent training without regard for increases in the number of types of airplanes that flight attendants are qualified on, the lack of standardization of equipment location, and, in some cases, without regard for the sophistication of training devices and for devices that realistically duplicate the equipment and procedures that flight attendants will need in actual emergencies. The lack of uniform guidance regarding compliance with the current FARs would be minimized if the FAA would issue its proposed AC on flight attendant training.

The Safety Board acknowledged the benefit of cabin safety specialists for oversight of air carrier training programs in its report on the runway incursion and collision of the DC-9 and B-727 at Detroit, Michigan, on December 3, 1990. The Safety Board believes that cabin safety specialists can provide valuable assistance to POIs in oversight of flight attendant training programs. Further, specialized training should be given to cabin safety specialists to ensure more consistent oversight of flight attendant training programs. Additionally, the Safety Board believes that the FAA should assign a cabin safety specialist to each of their 11 FAA regions to ensure oversight of flight attendant training programs. The FAA should also assign an additional Cabin Safety Specialist to each major carrier.

Flight attendant training and procedures for the control of passenger movement and the management of passenger response are critical to the successful completion of FAA-required evacuation demonstration tests. Because of this criticality, the Safety Board is concerned about the lack of emphasis in flight attendant handbooks, training, and procedures, especially regarding flight attendant assignments for optimum flow control of passengers during an evacuation.

The Safety Board believes that the training and procedures that were used to successfully complete evacuation demonstrations during the certification of an airplane, including flight attendant flow control responsibilities, should be included in crewmember training programs. It should be noted that Action Notice 8430.50 requires this for evacuation demonstration tests after 1990. For evacuation demonstrations prior to 1990, the FAA should review operator training programs to ensure that any procedures, assignments or training that were essential to the successful completion of an evacuation demonstration are required material in flight attendant initial, differences, and recurrent training.

Most flight attendants never encounter life-threatening emergencies during their careers. Other professionals that deal with life-threatening emergency situations, such as fire fighters, hone their skills during hands-on training, drills, and participation in actual emergencies. Conversely, flight attendants receive training to manage emergency situations but rarely have the opportunity to use the skills acquired during training. Emergency procedures, such as those required to prepare an airplane for an evacuation or a ditching, extinguish an in-flight fire, supervise the cabin following a decompression, handle a hijack situation, or manage passengers during an emergency evacuation, are rarely, if ever, used. Flight attendants must immediately change from passenger service-oriented roles to their critical safety-related roles in an emergency. Emergency situations typically require quick, assertive, and decisive action with little time for analysis of the situation. For most flight attendants, the only opportunity to practice skills needed in an emergency is during initial and recurrent training. These skills are perishable, and continuing and effective training is essential for maintaining them.

In many of the accidents examined in this investigation, the emergency situations were life threatening and extremely stressful. The Safety Board believes that these stresses may have led to ineffective and inappropriate flight attendant responses. Research by the U.S. Army Leadership Human Research Unit, at the Presidio, Monterey, California, "Performance Decrement Under Psychological Stress," attempted to evaluate situations that produced a "fear-effect" and "the contribution which this fear component makes to effectiveness and persistence of performance in stress."⁵ During three scenarios, test subjects were evaluated while performing tasks during normal and simulated life-threatening situations. One test scenario involved an actual flight with a simulated engine failure and anticipated ditching. The results of the tests showed statistically significant differences in the performance of tasks, including the correct completion of a complicated equipment repair. For subjects who uniformly believed that they were in life-threatening situations, there was an average decrement in their performance. Researchers noted that the subjects underwent a severe restriction in the perceptual field. For instance, relevant stimuli were not noticed, and inadvertent cues that the experimenters feared would compromise the deception failed to "register with the subjects." Some subjects reported becoming engrossed in tasks to the exclusion of other considerations. "All situations subsequently were characterized by a degradation of speed and accuracy." Data also indicated a difference between naive subjects and those more familiar with the context in which the "accident" occurred.

Another researcher examined the effects of stress on decision making and concluded that stress, (including time pressure, startle, loss of control, and fear) "prevented analytical decisions." Moreover, such stress can degrade decision making by blocking cues to gain situational understanding and by preventing a careful evaluation of risks associated with a course of

⁵ Mitchell M. Berkum, "Performance Decrement Under Psychological Stress," Human Factors (22 February, 1964) p. 21.

action.⁶ The researcher found that nonanalytical decision making, such as "recognition decision making," can be efficient, even under time stress. He suggested that "Experience allows people to rapidly size up a situation and recognize it as familiar so that they can recognize reasonable courses of action." To help decision makers cope with these stresses, he recommends training to help students recognize the emergency, rapidly gain a sense of situational dynamics, and prepare them to anticipate pitfalls in their chosen courses of action. Training that places students in unpredictable situations and teaches them to recognize and evaluate the situation quickly is effective in coping with stress and can assist them in choosing the appropriate action.

Although the Safety Board found no research on the performance of flight attendants under stress, the research described above can be applied to flight attendant training programs. Since flight attendants are expected to deal with emergency situations that can be stressful and/or life threatening, flight attendant training programs should teach them to recognize, anticipate and accommodate the stresses that may accompany life-threatening situations. Skills that are needed during emergencies are only practiced during initial and recurrent training. Therefore, it is essential for flight attendants to be thoroughly trained and to be aware of how to focus on learned skills and procedures during times of stress. Training programs must instill in flight attendants confidence in their abilities to handle emergencies.

The Safety Board recognizes that training can never truly duplicate the types of situations that may confront flight attendants, such as the DC-10 accident in Sioux City, Iowa, the DC-9 runway incursion in Detroit, Michigan, or the B-737 ground collision in Los Angeles, California. Nonetheless, training can instill the basic skills and confidence that will allow flight attendants to handle life-threatening situations. As the crashworthiness of transport-category airplanes improves and accidents become more survivable, flight attendants are assuming a more critical role for ensuring passenger safety. Because of these changes, FAA oversight should ensure that flight attendant training consistently results in no less than a minimum level of proficiency so that flight attendants can perform their duties effectively during emergencies.

As a result of this special investigation, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Update the proposed Advisory Circular (AC) on Crewmember Cabin Safety Training to include the safety recommendations from this report and previous Safety Board comments on the Notice of Proposed Rulemaking, and expedite the issuance of this AC that was published for comment at 52 FR 44664 on November 20, 1987. (Class II, Priority Action) (A-92-66)

⁶ Gary A. Klein, "Effects of Stress on Decision Making" in Proceedings of the 3rd Topical Meeting on Emergency Preparedness and Response, sponsored by the American Nuclear Society, April 16-19, 1991.

Include in FAA Order 8400.10 procedures for approving the reduction in hours of flight attendant recurrent training programs. Specific guidance should be included for granting waivers to reduce hours that takes into consideration the number of types of aircraft for which flight attendants are qualified, the accuracy and effectiveness of training devices and simulators, and the methods used to test and evaluate proficiency. (Class II, Priority Action) (A-92-67)

Ensure that flight attendant training programs include instruction on human performance of crewmembers (flight attendants and pilots) and passengers under stressful situations, and on methods to compensate for such behavior. (Class II, Priority Action) (A-92-68)

Ensure that flight attendant training programs provide detailed guidance on the relative probability of hazards associated with emergency situations such as fire, toxic smoke, and explosion. (Class II, Priority Action) (A-92-69)

Require flight attendant hands-on proficiency drills for each type of airplane exit, and ensure that flight attendants are evaluated individually by an instructor and that a record is kept that they have performed and successfully completed such drills. (Class II, Priority Action) (A-92-70)

Require that flight attendant training include drills on methods to open exits and to manage flow control at more than one exit if procedures require a flight attendant to be responsible for opening more than one exit. (Class II, Priority Action) (A-92-71)

Ensure that flight attendant training and procedures for each type of airplane include appropriate consideration of the training and procedures used during joint Part 25 and Part 121 certification evacuation demonstrations. (Class II, Priority Action) (A-92-72)

Assign separate Cabin Safety Specialists to each major air carrier and to each FAA region. (Class II, Priority Action) (A-92-73)

Amend 14 CFR Part 121.417 to require an evacuation and/or wet ditching drill group exercise during recurrent training. Ensure that all reasonable attempts are made to conduct joint flightcrew/flight attendant drills, especially for crewmembers operating on airplanes with two-person cockpit crews. (Class II, Priority Action) (A-92-74)

Review existing human factors research for the purpose of issuing guidance to Principal Operations Inspectors on methods of evaluating training programs to ensure that flight attendants retain the skills and knowledge that are necessary in emergency situations. If the review of the research does not provide the needed information, the FAA should establish a research program on

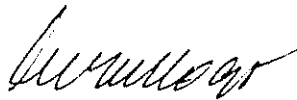
flight attendant knowledge and skill retention. (Class II, Priority Action) (A-92-75)

Update and reissue ACOB 76-4 regarding the operational characteristics of chemically generated passenger supplemental oxygen systems. (Class II, Priority Action) (A-92-76)

Require that flight attendants receive Crew Resource Management training that includes group exercises in order to improve crewmember coordination and communication. (Class II, Priority Action) (A-92-77)

Amend the Federal Aviation Regulations to include ergonomic design requirements for cabin safety equipment, including emergency exits. (Class II, Priority Action) (A-92-78)

Acting Chairman COUGHLIN, and Members LAUBER, HART, HAMMERSCHMIDT, and KOLSTAD adopted these recommendations.



By: Carl W. Vogt
Chairman

