



FLIGHT SAFETY FOUNDATION

CABIN CREW SAFETY

Vol. 36 No. 3

For Everyone Concerned With the Safety of Flight

May–June 2001

Many Passengers in Exit Seats Benefit From Additional Briefings

Air carriers worldwide use various methods to ensure that passengers who occupy exit seats meet requirements that help expedite evacuations. Increasingly, safety investigators and civil aviation authorities recommend that, in addition to general briefings of all passengers, flight attendants brief passengers in exit seats about their special functions.

—
FSF Editorial Staff

Passengers seated in rows adjacent to exits universally are expected to assist flight attendants during an emergency evacuation. Safety announcements and written/pictorial information typically are provided to all passengers, and training prepares flight attendants to use additional commands and instructions to passengers in conducting evacuations. Nevertheless, exit-seat passengers may or may not receive a personal briefing about what to do before they must take action.

For Type III exits and Type IV exits, exit-seat passenger functions vary among air carriers and among countries, but if the evacuation command is given aboard many transport aircraft, these passengers will need to decide quickly if the exit is safe to use, to open the exit hatch correctly, to follow instructions to stow the hatch (or otherwise dispose of the hatch) without blocking the exit, to help stabilize overwing slides (on some airplane types) and to tell other passengers to move away from the airplane.¹

Based on the performance of exit-seat passengers during actual evacuations and simulated evacuations, civil aviation authorities and air carriers in several parts of the world are rethinking basic assumptions to ensure, as much as possible, that passengers in exit seats have the information to be able to operate the emergency exit and to help in an aircraft evacuation.² Some operational requirements also specify that air carrier procedures



must prevent assigning to exit seats passengers who could impede crewmembers in performing their duties, obstruct access to emergency equipment or impede an evacuation.³ The need to reseat passengers who do not meet exit-seat criteria may occur more frequently as passengers increasingly make their own reservations, use self-check-in technologies to select seats, or occupy the exit seats for comfort or other reasons unrelated to safety.

Evacuation injuries following five transport aircraft accidents in the 1990s prompted the Civil Aviation Bureau of Japan (JCAB) to form two task forces and to recommend to airlines updated safety measures. Their objective was to reduce injuries after emergency evacuation from large airplanes, said Hiroaki Tomita, chief air carrier airworthiness engineer of JCAB.⁴

Among the recommendations were a common definition of exit seating for all Japanese air carriers, changes in the briefing of passengers in exit seating and reexamination of how tour group members who do not speak the language of the cabin crew should receive safety briefings for exit seating.

“Of many countermeasures, the [1993] task force concentrated on the improvement of the passenger-briefing systems. ... The task force developed a standard package of information for inclusion in seat-back cards and videos,” Tomita said.

Regarding briefing of exit-seat passengers, the JCAB information included the following advice:

- To follow the crew’s instructions;
- To leave carry-on baggage in the aircraft;
- To remove high-heel shoes;
- To use path marking and exit marking;⁵
- To stay low in smoke;
- To open exit doors correctly;
- Not to open exit doors near fire;
- To slide down escape slides correctly;
- To help others at the bottom of the slide; and,
- To move away from the aircraft.

A 1996 JCAB task force focused on emergency assistance to crewmembers from occupants of exit seats, air carrier cooperation with travel agencies (to train tour-group travel attendants to assist in evacuations), safety information about evacuations and other safety information.

“The [1996 JCAB] task force was of the opinion that there are some tasks that should be performed by the cabin crew themselves and therefore should not be transferred to the exit-seat occupants,” Tomita said. “For instance, [the task force said that] judgment as to whether the exit door should be opened or not should remain as one of the cabin crew’s duties. As a result, the role of an exit-seat occupant was confined to the following:

- “Keep other passengers clear from the emergency exit door until crewmembers have completely opened it;
- “At the bottom of the slide, assist other passengers in standing up and getting off an escape slide immediately after reaching the ground;
- “Give a loud announcement [so] that passengers [move away from] the aircraft immediately after sliding down; and,
- “Perform other tasks considered necessary and [assigned] by the crewmembers.”

Japanese air carriers introduced the JCAB exit-seat information in April 1998. Pamphlets in question-and-answer format covered exit-seating tasks among other subjects, and were distributed to airlines, travel agents and other related companies for use in training. Briefing materials also were improved for passengers who have visual disabilities and hearing disabilities, he said.

Tomita said that, with the new recommendations in effect, the evacuation of a Japanese air carrier’s McDonnell Douglas MD-11 airplane — which ran off the side of the runway June 14, 1998, during landing at Ninoy Aquino International Airport in Manila, Philippines — resulted in minor injuries to 24 passengers among 248 occupants.

“Evacuation was carried out in a smooth way since the concept of exit seating was well-demonstrated by the cabin crews and the passengers,” he said. “It is worth noting that one sightless person was able to slide down smoothly with the help extended by a passenger at the bottom of the slide.”

Civil aviation regulations in Japan do not address where to place an exit hatch after removal; air carriers use information from aircraft manufacturers, Tomita said.

Aircraft manufacturers provide information about exit-hatch placement and air carriers determine policy, which varies by air carrier and by aircraft type, said Mary Anne Greczyn, communications manager for Airbus Industrie of North America.⁶

“Generally, Airbus suggests to airlines that for evacuations involving a slide, the hatch be left inside the aircraft and for evacuations not involving a slide, the hatch be placed outside the aircraft ... the ultimate decision is left to the airline to determine.”

The role of the airplane manufacturer is to provide equipment, including instructions about how the exit hatch works, said Elizabeth Davis, communications specialist in Commercial Aviation Services, Boeing Commercial Airplanes.⁷

“Airlines determine the procedures for door disposal that will be used in an emergency,” she said. “We can give airlines options — for example, one option for the overwing hatch is to throw it outside and another is to [place the hatch] out of the way inside the airplane — but the decision depends on the evacuation situation and, ultimately, is the operators’ responsibility based on their own criteria and conclusions.”

A review by the U.S. Federal Aviation Administration (FAA) of worldwide research said, “Human factors effects predominate in controlling evacuation performance, and obscure the effects of other evacuation factors. ... Blockages of the Type III exit by [test passengers] during competitive evacuation trials is related more to the attitudes and motivation levels of individual [passengers,] not passageway configuration. ... Exit [hatch] removal and disposal is affected little by passageway configuration, although placement of the [hatch] after removal has been shown to be a variable, resulting from poor instruction about what to do with it. ... Information materials, such as safety-briefing cards, related to emergency evacuation activities have been poorly rendered, as passengers either cannot understand the intent of the materials or do not seem obliged to read and follow the instructions.”⁸

Expected Role of Passengers Affects Briefing Policies

Civil aviation authorities in some countries make a distinction in passenger-briefing policies between exit rows that have cabin crewmembers assigned to the exit and exit seats located in rows adjacent to Type III exits and Type IV exits, said Allan Tang, flight operations manager for the Civil Aviation Authority of Singapore (CAAS). Tang said that he has reviewed exit seating requirements among international civil aviation authorities.⁹

If exit seats do not have cabin crewmembers assigned or seated adjacent to the exit, a briefing of the passengers in exit seats by the cabin crew is mandatory in some countries, Tang said.

“Many [civil aviation] authorities do not see the need for such briefings for [passengers when exits are assigned to cabin crewmembers],” he said. “In the case of Singapore, it is mandatory for each floor-level exit to be manned by a cabin crewmember. Our minimum cabin crew complement is well in excess of the 1-to-50 rule (i.e., 12 cabin crewmembers for a Boeing 747 [typical current B-747s have 421 seats, some variants have up to 568 seats]) and, hence, the need for a special briefing ... need not arise [for passengers in exit seats assigned to crewmembers].”

Tang said that in Singapore, the check-in staff is required *not* to assign exit seats to the following categories of passengers:

- Disabled passengers, including blind passengers and deaf passengers;
- Elderly passengers or frail passengers who appear to be incapable of operating the Type III exit or Type IV exit, or appear to be unable to assist with the operation of the exit;
- Accompanied children, unaccompanied children and infants;
- Deportees or prisoners in custody; and,
- Obese passengers [some regulations say “passengers whose physical size would prevent them from being able to move quickly”].

Regulations of some countries require that disabled passengers be seated in a preassigned location designated by the air carrier by agreement with the civil aviation authority, he said.

The basic principle among air carriers he has reviewed is that the seats forming the access route from the cabin aisle to exits only should be assigned to passengers who appear capable of operating the exit and/or assisting with the operation of the exit, said Tang. Air carriers in Singapore, after review by CAAS, are adopting the practice of throwing exit hatches outside the airplane during evacuations, he said. Airline passenger check-in staff typically must assign seats

based on this requirement, and some regulations specify that preference should be given, where possible, to seating off-duty crewmembers at these locations, he said.

Typically, check-in staff also are expected to assign exit seats to passengers who speak the same language as the cabin crew. This assignment is difficult when the members of a large tour speak a different language.

“If [seating such passengers in exit seats] cannot be avoided, the [tour group’s] interpreter would be the best person to be [assigned] to the exit seat [because] the tour group [members] will look upon him or her as the leader — even in an evacuation,” said Tang. “The roles of the cabin crew [regarding exit seats] are to act as a second line of defense to ensure compliance and to brief passengers for [the use of exits not assigned to cabin crewmembers]. The cabin crew will have the final say — [for example,] a judgment call by the cabin crew to determine whether a passenger is considered obese. Cultural differences [exist] in accepting safety requirements, and individual [passenger] rights differ [in] various parts of the world. Passengers can be off-loaded under the authority of the captain if they choose to be defiant.”

He said that, on some flights in the region, he has heard passengers say that they did not want to be responsible for operating exits, and the passengers were resealed willingly.

Tang said, “For free-seating [unassigned seating] flights, cabin crew should be stationed at [Type III/Type IV exits] to ensure that passengers meet these requirements. For their own personal safety and that of other passengers, cabin crews should give a special one-on-one briefing to the assigned passenger seated nearest to the exit. The check [of passengers in] exit seating must be carried out during boarding and before closing the door.”

One Asian air carrier conducts additional briefings for all passengers in rows that have exit seats, he said. Flight attendants typically are expected to relocate during flight any passengers who become unwilling or unable to perform exit-seat functions.

The International Air Transport Association (IATA) Cabin Safety Working Group has developed guidelines for seating passengers in rows adjacent to emergency exits for the *IATA In-flight Management Manual*, which is scheduled for publication in 2001. The guidelines emphasize the need for air carriers to have clear policies about exit-seat assignments; the role of the cabin crew in reseating passengers, regardless of seat assignments by check-in agents, if a crewmember believes that a passenger in an exit seat might impede an evacuation; the provision of passenger information sheets for emergency-exit seats; and the need for advance briefings of cabin crews and passengers about aircraft configuration, specific restrictions, facilities and the seating of passengers who have special seating requirements. IATA does not have a policy about where to place an exit hatch after removal.¹⁰

U.K. Research Evaluates Benefits of Exit-seat Briefings

In the United Kingdom, the U.K. Civil Aviation Authority (U.K. CAA) has required a discreet briefing of passengers at Type III/Type IV exits for many years, said Nick Butcher, head of the Flight Operations Department Cabin Safety Office. U.K. CAA's latest research into briefing passengers in exit seats has been designed to help regulators and air carriers to evaluate several types of briefings.¹¹

"We wish to determine the best format of [exit-seat] briefing, taking into account the limited amount of time that cabin crew have to perform this procedure — especially for aircraft which have more than one pair of Type III exits (i.e., aircraft with two pairs of Type III exits such as the Boeing 737-400/700/800, Boeing 757, Boeing 767 and Airbus A320)," Butcher said. "These aircraft might require four such separate briefings, which can become time consuming."

U.K. aviation regulations (CAP 360 Part 1) currently require the discreet briefing of passengers seated next to Type III exits and Type IV exits, and that the briefing should include, as a minimum, instruction on the operation of these exits. U.K. CAA Airworthiness Notice 79 also requires seat-back placards depicting the operation of the Type III exits and Type IV exits. (Similarly, U.S. Federal Aviation Regulations [FARs] Part 25.811 requires placards with written or illustrated operating instructions for each Type III exit, including the use of handholds, the weight of the removable hatch and where to place the hatch after removal.)

"All U.K. operators have an exit-seat requirement restricting the types of passengers who can sit in Type III [exit-seat rows] and Type IV exit-seat rows," he said. "These include [disabled] persons including blind [passengers] and deaf [passengers], persons who are elderly or frail, children and infants (whether accompanied or not), deportees, prisoners in custody and obese passengers."

Because U.K. air carriers train their crews to respond to questions and concerns about exit-seat criteria, problems are infrequent, he said.

"In the United Kingdom, we have not had complaints from disabled passengers about the seating restrictions at Type III [exits] and Type IV exits," Butcher said. "They appear to recognize the safety reasons behind such restrictions."

U.K. CAA — in a July 2001 report about evacuation research conducted by Cranfield University College of Aeronautics using a narrow-body cabin simulator — analyzed data to help safety specialists evaluate the advantages and practical issues involved when cabin crews provide an additional briefing for airline passengers occupying seats adjacent to Type III exits.¹²

"[The research] was intended to obtain data to indicate whether variations in exit briefing influenced the behavior

of passengers occupying a Type III exit row in deciding on how to operate the exit, and the consequential effectiveness of operation during simulated accident conditions," the report said.

All participants were volunteers recruited through public advertisements, and none had operated previously a Type III exit. The mean age of all the participants was 32 years (20 years to 50 years for males; 21 years to 49 years for females).

The report extended previous efforts to study the effects of reducing the hatch weight and previous efforts to simplify the mechanisms used to open the hatch.

U.K. CAA said that previous research found that Type III exits have been "extremely effective" in accidents, but several factors have influenced passengers' success in using them: the weight of the exit hatch, the inherent design (for which the method of operation is not intuitive for some passengers) and inappropriate decisions by passengers about opening the exits.

U.K. air carriers' procedures for overwing evacuations instruct passengers to dispose of the exit hatch *outside* the aircraft; this practice is shown in passenger safety-information cards and on seat-back placards, the report said. Researchers observed that the participants who did not place the exit hatch onto the wing, as instructed, often let it drop to the floor in the cabin.

"[This] strategy ... was inherently quicker than placing the exit onto the wing," the report said. "It also meant that the hatch became a potential hindrance, obstructing passage through the exit."

Researchers tested 56 groups of three participants, with one female in half the groups and one male in half the groups (the minority-sex participant always was seated adjacent to the exit).

Each group received one of the following: no briefing (no information about operation of the exit), a minimum briefing (mentioning only the participant's responsibility and where to find the exit-operation diagram), a verbal briefing only or a written briefing only. Identical information in the verbal briefing and the written briefing included specific details on exit operation and the location of the exit-operation diagrams, the report said.

Minimum briefings ranged in length from 16.4 seconds to 30.8 seconds. Detailed verbal briefings — including time to answer any questions — ranged in length from 62.4 seconds to 70.4 seconds.

"The test protocol involved participants entering the [cabin] simulator and being shown to their seats," said the report. "They were then given one of the four briefing scenarios before being offered some [unrelated] reading material. Following this, participants heard the sound of the engines for five minutes

before they were given the evacuation command. Participants were not given any direction from the cabin crew to open their exits. The performance of the participants was documented using video cameras with internal time bases, and questionnaires.”

The report contained the following conclusions:

- “Providing passengers with additional detailed briefing information about the operation of the Type III exit increased the probability that the exit would be operated and disposed of quickly and correctly;
- “The total time to operate the exit (i.e., from the evacuation command to the exit becoming available) improved with more detailed briefings. This was primarily [because] the more detailed briefings reduced the hesitation time taken by participants to start to operate the exit;
- “The hesitation time shown by participants between the evacuation command and their initiation of the operation of the exit was shorter when participants had received either an additional verbal briefing or [additional] written briefing, than when participants had received minimum [briefing] or no briefing. (This may have occurred because participants in the additional verbal [briefing groups] and [additional] written briefing groups felt more confident as a result of the briefing and, as a consequence, hesitated for a shorter time period.);
- “The participants who had looked at the exit-operation diagrams prior to operating the exit appeared to have a clearer understanding of how the exit operated and where to dispose of the exit hatch;
- “There was no significant difference between the time taken for male [participants] and female participants to operate the exit. However, female participants who operated the exit reported finding the task more difficult and received significantly more assistance from other participants than their male counterparts;
- “The verbal and written briefings were rated by participants as being clearer than the minimum briefing. The verbal briefing was given higher ratings by participants than the written briefing”;
- “It proved difficult to ensure that participants assessed external conditions prior to operation of the exit. However, participants in this experiment were aware that they were in a laboratory. Passengers may be more likely to assess the external conditions prior to operating the exit in a real incident or accident; [and,]
- The verbal briefing took significantly longer to give than the minimum briefing.”

Participants who received exit briefings showed that they were more aware of their exit-operation responsibility, which increased the number of participants who, in turn, studied the exit diagrams.

The verbal briefings contained many details to assist the participants.

“Once seated, the participants were informed by the cabin crew that they were seated next to an exit, which may have to be operated in an emergency,” the report said. “In addition, their attention was drawn to the exit-operation placards on the back of the seat in front of them and on the passenger safety card. They were also given verbal instructions on when the exit should be opened and how to operate it, as well as a clear indication that the exit is a hatch and not a hinged door. The cabin crew also pointed to the items described in the briefing (operating handle, window, hand recess in exit hatch). Guidance as to the weight of the hatch and where to dispose of it was also given. Once the cabin crew had completed the briefing, participants were asked if there were any points that needed clarification.”

The written briefings similarly contained many details to assist the participants.

“Once seated, the participants were presented with a written briefing,” said the report. “The passenger safety card and placards on the seat backs were also brought to their attention. After the pre-flight safety briefing demonstration, the cabin crew gave participants the opportunity to ask any questions about the information.”

After their evacuations, participants gave their opinions of the clarity of instructions and rated the ease of opening the hatch. Participants also were debriefed to identify any problems in opening the exit and/or evacuating onto the wing.

Data included each participant’s hesitation time (from the command to evacuate to the moment at which a participant’s hand touched the operating handle) and the time each participant took to make the exit available (from the moment at which a participant’s hand touched the operating handle to when the exit was available for evacuation).

The data showed the following:

- “Significantly fewer of the participants in the no-briefing group studied the diagrams;
- “[Among] participants who actually operated the exit, 90 percent reported looking at the exit-operating diagrams on the passenger safety card;
- “[Participants] who did not [study the diagrams] were all from the no-briefing group;

- “Although most of the participants who operated the exit had looked at the exit briefing information, 25 percent of the participants who operated the exit left the exit [hatch] inside the cabin, either between the seats in the exit row or on the seats;
- “More participants who operated the exit in the written [briefing group] and verbal briefing group correctly disposed of the exit [hatch as instructed, by placing the hatch onto the wing outside the aircraft]; and,
- “The sex of the participant [who] operated the exit was ... found to have no influence on the correct operation of the exit [or exit-operation hesitation times].”

Statistical tests showed that both the mean hesitation times and the total times to operate the exit were influenced significantly by the type of exit briefing the participant had received, the report said.

The researchers concluded, however, that the mean time taken by the participants to make the exit available was *not* significantly influenced by the type of exit briefing they had received.

Many of the participants who operated the exit received assistance from fellow participants. The type of assistance given ranged from verbal help, telling the participant who operated the exit what to do, to physical help in maneuvering the exit.

“The type of briefing a group had received did not significantly influence whether or not the other participants offered any assistance to the participant who operated the exit,” said the report. “The participants who offered help reported that they did so because it became apparent that the participant operating the exit was struggling with the weight of the exit hatch, finding it difficult to maneuver through the aperture.”

In the no-briefing group, none of the participants assessed external conditions before opening the exit. In the minimum-briefing group, 14.3 percent of participants who operated the exit assessed external conditions. In the verbal-briefing group, 21.4 percent assessed outside conditions. In the written-briefing group, 46.2 percent assessed outside conditions.

The report said, “The majority of [participants who operated exits] in the no-briefing [groups] and the minimum-briefing groups failed to recognize that the exit hatch was not attached to the fuselage [and had no hinges]. Failure to comprehend this [fact] meant that many of the participants dropped the exit hatch to the floor or were not expecting to support and maneuver the exit through the aperture.

“Failure to look at the exit-operation diagrams led to many of the participants being surprised about the way in which the

exit operated. Many were surprised that the exit [hatch] moved inwards, causing delay and difficulties in maneuvering the hatch. The [no-briefing group] participants ... were also unclear about where to dispose of the exit hatch. Significantly more of the participants in this group left the exit hatch inside the aircraft where it could become a hindrance in a real emergency evacuation.

“The participants in the verbal [briefing groups] and written briefing groups reported feeling responsible for the [exit] operation and being empowered to operate the exit when hearing the command to evacuate. The majority of participants in these two groups reported that they knew that this was the cue to operate the exit and any ambiguity about the situation was removed. [The] participants in the no-briefing group reported feeling unclear about whether they should operate the exit even when hearing the command to evacuate. Many participants in the no-briefing group believed [that] the cabin crewmember would tell them specifically when to operate the exit, or would come and perform the task. In two of the no-briefing groups, the participants’ first reaction was to move [away from the Type III exit] toward the exit at the rear of the aircraft, where the cabin crewmember was stationed.”

Participants subjectively rated most highly the personal verbal briefing, during which crewmembers pointed to specific equipment as they explained exit operation.

The report said that researchers also learned the following from observing/debriefing participants:

- If they were not instructed to assess outside conditions before opening an exit, participants failed to take this step. Among participants who received this specific instruction before the evacuation, half did not remember to assess outside conditions before they opened the exit. Several participants said that they forgot to do so because their thoughts were focused on escaping from the aircraft; and,
- Participants from the no-briefing groups and minimum-briefing groups said that they could not understand the safety-placard diagram showing that the Type III exit should not be operated if fire is present.

The researchers recognized that the extra time required for flight attendants to give additional briefings would have practical implications.

“Even when participants sought further clarification or instructions, the longest verbal briefing took only 70 seconds — albeit for just one exit row on one side of the cabin,” said the report. “Verbal briefings given to both sides of the cabin — and especially on aircraft with more than one pair of Type III exits [for example, Airbus A320, B-737-400, etc.] — are likely to take significantly more time.”

Australian Safety Authority Reviews Exit-seat Practices

In a current review of safety regulations affecting large airplanes, the Civil Aviation Safety Authority of Australia has opened for discussion several aspects of passenger seating at unsupervised exits, including the following:

- Clarifying “persons with reduced mobility” (defined as someone whose mobility is reduced because of physical incapacity [sensory or locomotory], an intellectual deficiency, age, illness or any other cause of disability when using transport and when the situation needs special attention);
- Restricting people with reduced mobility from being seated adjacent to an emergency exit;
- Limiting passengers with reduced mobility so that the total number on a flight does not exceed the number of able-bodied passengers capable of assisting with an emergency evacuation;
- Requiring air carriers to assign exit seats only to passengers who appear to be “reasonably fit, strong and able to assist the rapid evacuation of the airplane in an emergency”;
- Requiring air carriers — during check-in — to assign to non-exit seats passengers who, because of their condition, might hinder other passengers during an evacuation or who might impede crewmembers in carrying out their duties;
- Specifying that exit-seat criteria preclude “passengers suffering from obvious physical, or mental, handicap to the extent that they would have difficulty in moving quickly if asked to do so; passengers who are either substantially blind or substantially deaf to the extent that they might not readily assimilate printed or verbal instructions given; passengers who because of age or sickness are so frail that they have difficulty in moving quickly; passengers who are so obese that they would have difficulty in moving quickly or reaching and passing through the adjacent emergency exit; children (whether accompanied or not) and infants; deportees or prisoners in custody; and, passengers with animals.” Australian Civil Aviation Safety Regulations do not specify where to place an exit hatch after removal.¹³

U.S. Regulations Balance Safety, Protection of Passenger Rights

In April 2001, the U.S. Federal Aviation Administration (FAA) published information and guidance for FAA principal operations inspectors (POIs) and cabin safety inspectors

(CSIs) who evaluate and approve air carrier exit-seating programs, which are required by FARs Part 121.585, Exit Seating, and Part 135.129, Exit Seating. The recommendations are in Flight Standards Handbook Bulletin for Air Transportation (HBAT) no. HBAT 01-02, *Air Carrier Exit Seating Program Development*. FAA allows carriers to place in exit seats only people who can perform functions necessary in an emergency evacuation.¹⁴

Flight attendants ultimately are responsible for compliance. They must comply, consistently and in a nondiscriminatory manner, by reseating passengers who do not meet FAA’s neutral selection criteria. Reseating is required by Part 121.585 if any of the following are apparent (paragraph numbers deleted):

- “The passenger lacks sufficient mobility, strength, or dexterity in both arms and hands, and both legs to reach upward, sideways and downward to the location of emergency exit and exit-slide operating mechanisms; to grasp and push, pull, turn or otherwise manipulate those mechanisms; to push, shove, pull or otherwise open emergency exits; to lift out, hold, deposit on nearby seats, or maneuver over the seatbacks to the next row objects the size and weight of overwing [exit hatches]; to remove obstructions similar in size and weight to over-wing exit [hatches]; to reach the emergency exit expeditiously; to maintain balance while removing obstructions; to exit expeditiously; to stabilize an escape slide after deployment; or to assist others in getting off an escape slide;
- “The passenger is less than 15 years of age or lacks the capacity to perform one or more exit-seating functions without the assistance of an adult companion, parent or other relative;
- “The passenger lacks the ability to read and understand instructions related to emergency evacuation provided by the airline in printed or graphic form or lacks the ability to understand oral crew commands;
- “The passenger lacks sufficient visual capacity to perform one or more exit-seat functions without the assistance of visual aids beyond contact lenses or eyeglasses;
- “The passenger lacks sufficient aural capacity to hear and understand instructions shouted by flight attendants, without assistance beyond a hearing aid;
- “The passenger lacks the ability to impart information orally to other passengers; or,
- “The passenger has a condition or responsibilities, such as caring for small children, that might prevent performing one or more exit-seat functions, or a condition that might cause the passenger harm if he or she performs one or more of the exit-seat functions.”

FARs Part 121.585 says that passengers in exit seats must be provided information cards to perform the following functions during an emergency in which a crewmember is not available:

- “Locate the emergency exit;
- “Recognize the emergency exit opening mechanism;
- “Comprehend the instructions for operating the emergency exit;
- “Operate the emergency exit;
- “Assess whether opening the emergency exit will increase the hazards to which passengers may be exposed;
- “Follow oral directions [commands] and hand signals given by a crewmember [for example, a flight attendant pointing to exits on one side of the airplane when noise makes commands inaudible];
- “Stow or secure the emergency exit door so that it will not impede use of the exit;
- “Assess the condition of an escape slide, activate the slide, and stabilize the slide after deployment to assist others in getting off the slide;
- “Pass expeditiously through the emergency exit; and,
- “Assess, select and follow a safe path away from the emergency exit.”

In written information provided to the passengers in exit seats, U.S. air carriers also must include a request that any passenger “identify himself or herself to allow reseating if he or she cannot meet the selection criteria ... has a nondiscernible condition that will prevent him or her from performing the [exit-seat] functions ... may suffer bodily harm as the result of performing one or more of [the exit-seat] functions or does not wish to perform those functions.”

Each passenger assigned to an exit seat also must be asked to identify himself or herself to allow reseating “if he or she lacks the ability to read, speak or understand the language or the graphic form in which instructions ... are provided ... or the ability to understand the specified language in which crew commands will be given in an emergency.”

Crewmembers are prohibited from requiring the passenger to disclose his or her reason for needing reseating, however.

The regulation also says, “In the event a certificate-holder determines ... that it is likely that a passenger assigned to an exit seat would be unable to perform the [exit-seat] functions ... or a passenger requests a non-exit seat, the certificate-holder shall expeditiously relocate the passenger to a non-exit seat.”

A U.S. air carrier can deny transportation to a passenger who does not meet exit-seat criteria if the passenger refuses to comply with instructions given by a crewmember or other employee enforcing FAA exit-seat restrictions, or if the only seat that will accommodate a passenger’s disability is an exit seat.

As an example of avoiding discrimination, the HBAT said that age (with the exception of all passengers younger than 15 years of age) or the size of a passenger alone should not be the determining factor.

The HBAT said, “The airline employee must evaluate the individual’s physical and mental capabilities, and other conditions, as clearly outlined in the selection criteria. If that individual meets all the selection criteria, then age or size alone should not be a disqualifying factor. However, if that individual has difficulty walking and lifting his/her own carry-on luggage, then the application of the neutral criteria would exclude this individual from being assigned an exit seat because it would appear by observation that the individual would not be able to move expeditiously and perform the tasks involved in the emergency evacuation.”

The regulation also says that certificate holders must assign seats prior to boarding to the maximum extent feasible.

FAA Encourages Additional Briefing of Exit-seat Passengers

The HBAT said that many U.S. airlines have trained and designated cabin crewmembers to conduct “structured personal conversations or briefings,” beyond the elements in the general oral briefing required by Part 121.585, to ensure that the passengers in exit seats can hear, understand and speak the language used by the crew.

The HBAT said, “POIs and CSIs should strongly encourage their assigned certificate holders to consider the safety benefits that are accomplished by individual exit seat briefings and to include such briefings in their predeparture procedures. In the absence of procedures that require individual briefings, [they] should ensure that each carrier has a method in place to ensure compliance with [Part] 121.585(g), which requires verification by a required crewmember that the passengers can perform all required functions, which includes the ability to follow oral directions. ... Fluency in the language of the [airline crew] is not required as long as the exit seat passengers can understand crew instructions, commands, the graphic illustrations related to exit seat functions and are able to adequately impart information related to emergency functions.”

The HBAT contains detailed recommendations for air carriers to obtain, in advance, special approval to conduct operations in which passengers speak a language other than the language of the crew.

Safety, Passengers' Rights Are Not Mutually Exclusive

In the late 1980s, FAA coordinated rulemaking with the U.S. Department of Transportation (DOT) in developing regulations about exit seating. FARs Part 121.585, *Exit Seating*, and DOT Part 382, *Nondiscrimination on the Basis of Disability in Air Travel*, became effective in March 1990. Part 382 prohibits air carriers from discriminating against any otherwise qualified individual with a disability, by reason of the disability, in providing air transportation.

Regarding seat assignments, Part 382.37 says, "Carriers shall not exclude any qualified individual with a disability from any seat in an exit row or other location or require that a qualified individual with a disability sit in any particular seat, on the basis of disability, except in order to comply with the requirements of an FAA safety regulation or as provided in this section."

Nancy Claussen, one of the FAA cabin safety inspectors who developed the HBAT, said that knowledge of Part 382, which addresses passengers' rights, as well as Part 121.585, which contains the safety regulations, increases flight attendants' confidence about the basis for making appropriate exit-seat decisions in the cabin.¹⁵

"Holding a boarding pass for a specific seat does not guarantee that a passenger will remain there," Claussen said. "Given crew concerns about infringing on passengers' rights, it is comforting for flight attendants to know that in complying with the FARs, they also are complying with Part 382."

By the same token, if crewmembers are unfamiliar with Part 382, they may be reluctant to be assertive in requiring compliance by passengers with the FARs, she said.

Most seats in a row adjacent to an exit are designated as exit seats by the air carrier, but exceptions exist because the definition of an exit seat is "a seat from which a passenger can proceed directly to the exit without entering an aisle or passing around an obstruction." This excludes seats that are partially obstructed from the exit (for example, by a bulkhead).

"As long as airlines comply with the regulations, their passengers meet exit-seat selection criteria, a required crewmember is available to verify compliance and the crewmember conducts verification prior to pushback [or taxi], we recognize that many methods to achieve compliance are possible," she said. "Airlines will determine the method that works best for them."

Claussen said that the following methods have been used:

- Assigning one designated crewmember to brief passengers in each row of exit seats;
- Training all flight attendants to participate in making passive visual assessments; and,

- Training all flight attendants to engage in active assessments, quick interactions with passengers that elicit sufficient information to know whether passengers meet exit-seat selection criteria.

Most air carriers assign seats; other air carriers with non-assigned seating have added flight attendant procedures to ensure that only qualified people occupy exit seats.

"If someone is assigned to an exit seat before boarding, but during verification a cabin crewmember says that the person does not meet selection criteria, the crewmember's decision must be addressed," said Claussen.

The following are examples of reasons for reseating passengers:

- An adult passenger traveling with an 11-year-old daughter checks in and is assigned exit-row seats because the daughter was not observed with the adult during check-in or boarding. The crewmember responsible for verifying compliance with exit-seating selection criteria would be expected to recognize and reseat the passenger who had not reached her 15th birthday; and,
- Passengers who do not meet exit-seat criteria but occupy exit seats instead of their assigned seats.

The FARs require each airline to designate someone at each airport — a complaint resolution officer (CRO) trained to interpret and explain the applicable regulations — to resolve disagreements about sitting in exit seats. Among smaller U.S. airlines, the captain of the aircraft often is trained and designated as the CRO.

"Some airlines train their crews for a quick give-and-take conversation with passengers in exit seats to assess whether they can understand the language spoken by the cabin crew and that they are aware that they are in an exit seat," she said. "Certainly, however, there is the added safety benefit of some team-building. FAA exit-seat regulations have not changed, but inspectors will see if there are best practices they want to discuss with airlines, and airlines will take these points under advisement."

During development of the HBAT, however, U.S. airlines had several concerns. They said that increasing flight attendants' responsibilities for briefing passengers in exit seats during the boarding phase of flight would be less effective than all passengers hearing the announcements about exit seats, that additional briefings would repeat information provided in predeparture announcements and exit-seat briefing cards, and that the potential for delay of flights would increase. The Air Transport Association of America does not have a policy about where to place an exit hatch after removal.¹⁶

"A valid point is that boarding is the most hectic phase of flight," she said. "FAA and the [U.S.] National Transportation Safety

Board believe that the benefits outweigh the time-management issues. Thirty seconds of assessing passengers and reminding them that they are in exit seats is 30 seconds well spent.”

Claussen said that cabin crews must not rely solely on a general announcement about exit seating.

“The flaw in using only a general announcement is that the airline would be missing an essential component: verification,” she said. “The more specifics, the better. We recommend that flight attendants say ‘Rows 11 and 12 on this aircraft are exit seats’ and not say ‘If you are in an exit row.’ Hearing the row number will get passengers’ attention.”

Although flight attendants are required to be knowledgeable about the exit-seat selection criteria, the current system also provides tools to assist communicating with passengers.

“The briefing card in the exit row is a tool for flight attendants and passengers so that everyone can be on same page about the criteria,” she said. “Nearly all U.S. airlines also print the selection criteria on passenger safety information cards throughout the aircraft.”

Best practices in the HBAT also include a recommendation for prelanding verification of all passengers in exit seats.

“Carriers must have procedures for situations when, during flight, a flight attendant becomes aware that a passenger no longer meets selection criteria because of a factor such as illness,” she said. “The crew needs to ensure that the passenger is not in that exit seat for landing. FAA’s suggestion is that each airline develop procedures for that situation — cabin crews should not have to make up procedures. We strongly encourage verification of passengers in exit seats on the before-landing cabin safety check.”

Current regulatory language does not require this verification before landing.

CAMI Evacuation Research Indirectly Considers Briefings

U.S. researchers in June 2001 were scheduled to complete video recordings of a total of 2,500 people evacuating from a narrow-body aircraft cabin simulator (similar to a B-737 cabin) via a Type III overwing exit in several test scenarios.

The research is being conducted by the FAA Civil Aeromedical Institute (CAMI) Protection and Survival Laboratory in Oklahoma City, Oklahoma, U.S. A report will be issued in 2002, said David Palmerton, a cabin safety researcher at CAMI.¹⁷ The European Joint Aviation Authorities (JAA) and the U.K. CAA participated in planning the Type III-exit evacuation study.

“Each organization had a different take on overwing-exit issues that they want to look at in coordination with the others,”

Palmerton said. “We will look primarily at row width to the overwing exit to find out if air carriers can get as many people out — provide an equivalent level of safety — with a 13-inch [33-centimeter row width] as with the 20-inch [51-centimeter] row width currently required by FARs.”

This research has been designed to minimize the effect of the passenger briefing on time to exit from the aircraft through Type III exits, he said. Nevertheless, briefing-related information will be gained indirectly about the maximum performance of passengers because they will have received the same CAMI-designed briefing from the researchers.

The briefing by the researcher comprises oral instructions on how to assess outside conditions, follow cabin crew commands and operate the exit hatch, and, during boarding, each “door handler” (mock passenger seated next to a Type III exit) was handed a pictorial exit-seat briefing card that showed how to remove the hatch and where to place it.

“All door handlers were given very clear instructions on what was expected of them,” Palmerton said. “We did not want people to be confused about what to do before receiving the evacuation command.”

Some U.S. air carriers now operate aircraft configured with a 13-inch exit-row width under special exemptions from FAA, Palmerton said.

“We also are looking at the difference in throwing the hatch outside the airplane as opposed to leaving [the hatch] across the armrests of the exit-row seats. A common weight for a Type III exit hatch is 48 pounds [22 kilograms]. We could find an interaction effect between the row width and what is done with the hatch.”

Researchers also varied the total number of passengers on the aircraft to compare the relative evacuation performance of groups of 30 passengers, 50 passengers and 70 passengers. The experiments were done in a “low-motivation” situation (in which passengers only were instructed to exit as quickly as possible as if they were escaping a fire) and a “high-motivation” situation (in which researchers gave the same instructions but also told all passengers that the 25 percent who achieved the fastest exit times would be paid a monetary bonus).

“We will determine the evacuation time of each subject in each experiment,” Palmerton said. “We hope this analysis finally will answer the 20-inch exit-width question. U.K. CAA, JAA and FAA want to know which exit-row width is better than the others and if it is better to keep the exit hatch inside the aircraft or to throw it out of the aircraft.”

Claussen said that FAA takes a neutral position on where to place an exit hatch after removal. Each U.S. air carrier must have — approved by FAA or acceptable to FAA, as required — procedures, training, exit marking, passenger

briefings and passenger safety instructions consistent with its own policy.

In summary, aviation regulations typically do not require training of exit-seat passengers, but do require that these passengers be informed of their special role, have adequate information available to perform their exit-seat functions without assistance from the cabin crew, and have no apparent inability or unwillingness to assist the crew during an emergency evacuation. Methods of briefing exit-seat passengers, therefore, must consider fully the air carrier's overall flight attendant training, passenger-safety communication and emergency procedures.♦

Notes and References

1. Joint Aviation Requirements 25.807 define a Type III exit as a rectangular opening of not less than 20 inches (508 millimeters [mm]) wide by 36 inches (914.4 mm) high with corner radii not greater than one-third the width of the exit, and with a step-up inside the airplane of not more than 20 inches. If the exit is located over the wing, the step-down outside the airplane may not exceed 27 inches (685.8 mm). A Type IV exit is a rectangular opening of not less than 19 inches (482.6 mm) wide by 26 inches (660.4 mm) high, with corner radii not greater than one-third the width of the exit, located over the wing, with a step-up inside the airplane of not more than 29 inches (736.6 mm) and a step-down outside the airplane of not more than 36 inches.
2. U.S. National Transportation Safety Board (NTSB). "Safety Study: Emergency Evacuation of Commercial Airplanes." NTSB/SS-00/01. June 27, 2000. Swindells, Trent. Civil Aviation Safety Authority of Australia (CASA). "The Big Brief: Are Australia's Passengers Prepared for an Evacuation?" *Flight Safety Australia*. March–April 2001, 39–40. CASA said that five Australian air carriers have adopted the policy of conducting additional briefings for exit-seat passengers. A regulatory requirement is being considered in the current rulemaking process, CASA said. Wokes, Frances. Transport Canada (TC). E-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 9, 2001. Flight Safety Foundation, Alexandria, Virginia, U.S. TC requires, among other things, that passengers know when they are in seats adjacent to an overwing emergency exit because passengers have said, after aircraft evacuations in Canada, that they were unaware of this exit. U.S. Department of Transportation (DOT). *New Horizons: Information for the Air Traveler With a Disability*. DOT Office of General Counsel, Aviation Consumer Protection Division. www.dot.gov.
3. For example, European Joint Aviation Requirements—Operations (JAR—OPS) 1.260, Carriage of Persons With Reduced Mobility, includes this guidance. JAR—OPS 1.280, Passenger Seating, says that air carriers must differentiate between "persons likely to assist evacuation" and "persons likely to impede evacuation," and that procedures must "ensure that passengers are seated where, in the event that an emergency evacuation is required, they may best assist and not hinder evacuation from the airplane."
4. Tomita, Hiroaki. "For Less Injuries After Emergency Evacuations." In *Proceedings of the 1998 International Aircraft Fire and Cabin Safety Research Conference*, Nov. 16–20, 1998, Atlantic City, New Jersey. CD-ROM no. DOT/FAA/AR-99/68 (U.S. Federal Aviation Administration, European Joint Aviation Authorities, Transport Canada Civil Aviation, Civil Aviation Bureau—Ministry of Transport of Japan, 1999). Tomita. E-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. June 15, 2001. Flight Safety Foundation, Alexandria, Virginia, U.S.
5. In U.S. Federal Aviation Regulations (FARs) Part 25.811, for example, *emergency exit marking* comprises elements such as conspicuous overhead locator signs, marking signs at exits, lighting of exit-operating handles, a red arrow and the word "open." In FARs Part 25.812, for example, *exit path marking* includes elements such as floor-proximity escape-path marking, a lighting system designed to provide guidance to exits for passengers during emergency evacuations when sources of illumination above the cabin floor are obscured totally.
6. Greczyn, Mary Anne. E-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. June 22, 2001. Flight Safety Foundation. Alexandria, Virginia, U.S.
7. Davis, Elizabeth. Telephone interview and e-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. June 25, 2001. Flight Safety Foundation. Alexandria, Virginia, U.S.
8. McLean, Garnet. "Access-to-Egress: A Meta-analysis of the Factors That Control Emergency Evacuation Through the Transport Airplane Type III Overwing Exit." U.S. Federal Aviation Administration Civil Aeromedical Institute, Office of Aviation Medicine report no. DOT/FAA/AM-01/2. January 2001.
9. Tang, Allan. E-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 15, 2001. Flight Safety Foundation, Alexandria, Virginia, U.S. The terms "self-help exit" and "unsupervised exit" are used in some countries for exit seats in rows that do not have an assigned cabin crewmember. Regardless of expected functions for exit-seat passengers, a Type III exit or Type IV exit is designed for passengers to operate without training.
10. Freund, Gillian. International Air Transport Association (IATA). E-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 23, 2001. Flight Safety

Foundation, Alexandria, Virginia, U.S. Woodburn, Paul. IATA. Telephone communication with Rosenkrans, Wayne. June 20, 2001.

11. Butcher, Nick. E-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 10, 2001. Flight Safety Foundation, Alexandria, Virginia, U.S.

12. Cobbett, Ann; Liston, Paul; Muir, Helen. "An Investigation Into Methods of Briefing Passengers at Type III Exits." U.K. Civil Aviation Authority Report no. 01/06. July 2001 (in press). The research was conducted by Cranfield University for U.K. CAA. The report said that the cabin simulator had the following configuration and features: "The seats fore and aft of the Type III exit were at a seat pitch of approximately 38 inches (97 centimeters) with a vertical projection between the seats of 13 inches (33 centimeters). The dimensions of the exit hatch in the cabin simulator were representative of those on a narrow-bodied transport aircraft. The Type III exit hatch weighed [47.4 pounds (21.5 kilograms)]. The vertical step-up from the floor to the bottom of each exit inside the cabin was 13.5 inches (34.4 centimeters), identical to that of a Boeing 737 aircraft. The step-down height from the bottom of each door onto the wing was 15 inches (38 centimeters), which, although [it] is identical to a [B-737], is considerably less than the maximum 23 inches (58.5 centimeters) allowed. The illustrations depicting the

operating method of the traditional exit were based on those currently used on [B-737] aircraft."

13. Martin, Julie. CASA. E-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 9, 2001 and June 21, 2001. Flight Safety Foundation, Alexandria, Virginia, U.S.

14. U.S. Federal Aviation Administration (FAA). Flight Standards Handbook Bulletin for Air Transportation (HBAT) no. HBAT 01-02, "Air Carrier Exit Seating Program Development." April 12, 2001. The FARs regulate exit seating in aircraft operated by U.S. air carrier and commercial operators, except for on-demand operations with aircraft having 19 or fewer passenger seats and commuter operations with aircraft having nine or fewer passenger seats.

15. Claussen, Nancy. Telephone interview with Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 8, 2001. Flight Safety Foundation, Alexandria, Virginia, U.S.

16. Welding, Ron. Air Transport Association of America. E-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 9, 2001 and June 22, 2001. Flight Safety Foundation, Alexandria, Virginia, U.S.

17. Palmerton, David. Telephone interview with Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 17, 2001. Flight Safety Foundation, Alexandria, Virginia, U.S.

Want more information about Flight Safety Foundation?

Contact Ann Hill, director, membership and development,
by e-mail: hill@flightsafety.org or by telephone: +1 (703) 739-6700, ext. 105.

Visit our World Wide Web site at <http://www.flightsafety.org>

We Encourage Reprints

Articles in this publication, in the interest of aviation safety, may be reprinted, in whole or in part, but may not be offered for sale, used commercially or distributed electronically on the Internet or on any other electronic media without the express written permission of Flight Safety Foundation's director of publications. All uses must credit Flight Safety Foundation, *Cabin Crew Safety*, the specific article(s) and the author(s). Please send two copies of the reprinted material to the director of publications. These reprint restrictions apply to all Flight Safety Foundation publications.

What's Your Input?

In keeping with FSF's independent and nonpartisan mission to disseminate objective safety information, Foundation publications solicit credible contributions that foster thought-provoking discussion of aviation safety issues. If you have an article proposal, a completed manuscript or a technical paper that may be appropriate for *Cabin Crew Safety*, please contact the director of publications. Reasonable care will be taken in handling a manuscript, but Flight Safety Foundation assumes no responsibility for material submitted. The publications staff reserves the right to edit all published submissions. The Foundation buys all rights to manuscripts and payment is made to authors upon publication. Contact the Publications Department for more information.

Cabin Crew Safety

Copyright © 2001 Flight Safety Foundation Inc. ISSN 1057-5553

Suggestions and opinions expressed in FSF publications belong to the author(s) and are not necessarily endorsed by Flight Safety Foundation. Content is not intended to take the place of information in company policy handbooks and equipment manuals, or to supersede government regulations.

Staff: Roger Rozelle, director of publications; Mark Lacagnina, managing editor; Wayne Rosenkrans, senior editor; Linda Werfelman, senior editor; Karen K. Ehrlich, web and print production coordinator; Ann L. Mullikin, production designer; and Susan D. Reed, production specialist; and, Patricia Setze, librarian, Jerry Lederer Aviation Safety Library

Subscriptions: One year subscription for six issues includes postage and handling: US\$240. Include old and new addresses when requesting address change. • Attention: Ahlam Wahdan, membership services coordinator, Flight Safety Foundation, Suite 300, 601 Madison Street, Alexandria, VA 22314 U.S. • Telephone: +1 (703) 739-6700 • Fax: +1 (703) 739-6708