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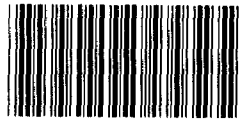

B-253319

June 8, 1993

The Honorable James L. Oberstar
Chairman
The Honorable William F. Clinger, Jr.
Ranking Minority Member
Subcommittee on Aviation
Committee on Public Works and Transportation
House of Representatives

The Honorable John D. Dingell
House of Representatives

The Honorable Ernest F. Hollings
Chairman, Committee on Commerce, Science,
and Transportation
United States Senate

The Honorable Wendell H. Ford
Chairman, Subcommittee on Aviation
Committee on Commerce, Science,
and Transportation
United States Senate

In response to your requests and subsequent agreements with your offices, this correspondence provides information on the Federal Aviation Administration's (FAA) emergency evacuation requirements for transport aircraft. Specifically, the correspondence summarizes

-- FAA's Aviation Rulemaking Advisory Committee's (ARAC) Emergency Evacuation Subcommittee's efforts to develop regulatory standards for enhancing passengers' ability to quickly and safely evacuate an aircraft in an emergency and

-- the impact on aircraft design if FAA reduced the 90-second emergency evacuation standard to 60 seconds.

Although we were also asked to provide information on the time to evacuate different aircraft types following an accident, we were unable to do so because reliable information was unavailable.

ARAC EMERGENCY EVACUATION ACTIVITIES

In 1991, FAA established an Aviation Rulemaking Advisory Committee, with several subcommittees. The Emergency Evacuation Subcommittee is to provide advice and recommendations to the Directors, FAA Aircraft Certification Service and Flight Standards Service, on (1) the need to develop safety performance standards for emergency evacuations and (2) how to minimize injuries during emergency evacuation demonstrations.

Need for Safety Performance Standards

FAA must evaluate and certify the airworthiness of each new aircraft model or each configuration change to an existing model, including the capability to evacuate the aircraft if an accident occurs. FAA recognizes that many factors must be evaluated in designing aircraft for safe evacuations. These include the interaction among cabin sizes, passenger capacity, the types and number of emergency exits, exit locations, distance between exits, aisle design, exit row and escape path markings and lighting, flame resistance of cabin interior materials, and other important variables. In past years, FAA has required design changes to aircraft interiors to improve evacuation capabilities. (Enc. I lists FAA's regulations related to emergency evacuations.) However, FAA is considering requiring performance standards for evacuation so as not to constrain design options. Performance-based standards state regulatory requirements in terms of objective safety performance rather than specific design requirements.

The Emergency Evacuation Subcommittee established a Performance Standards Working Group to make recommendations concerning whether emergency evacuation standards stated in terms of safety performance can replace, supplement, or be an alternative to the current standards related to emergency evacuations. If a performance standard is recommended as a replacement, then the working group must also determine how FAA can evaluate a new aircraft design or a change to an approved aircraft design.

To help determine whether performance standards can be defined for the key emergency evacuation elements, the working group is evaluating the relationship between FAA's current regulations and a logical emergency evacuation process (pre-evacuation, evacuation initiation, exit

operations, guidance from seat to exits, access from seat to exits, and egress). In assessing the need for a performance standard, the working group is considering whether the current regulations are (1) inconsistently applied to various aircraft sizes or types of operation, (2) more restrictive than their objectives warrant, and (3) inhibiting innovative design solutions and technologies. If the working group determines that performance standards are needed, then it must develop standards that are objective. Furthermore, it must define system requirements that can be measured by a combination of test, comparison, or analysis so that FAA can evaluate whether the standards achieve an acceptable level of airworthiness consistent with the basic objective of the regulation. The working group plans to make recommendations on the need to develop specific performance standards to the Emergency Evacuation Subcommittee during the summer of 1993.

Minimize Injuries During Evacuation Demonstrations

The Performance Standards Working Group was also charged with recommending new or revised emergency evacuation requirements and compliance methods that would eliminate or minimize the potential for injury to full-scale evacuation demonstration participants. For aircraft with 44 or more seats, FAA requires aircraft manufacturers or operators to show that the passengers and crew can be evacuated under simulated emergency conditions within 90 seconds. Under the current rule, unless the FAA Administrator finds that a combination of analysis and testing will provide data equivalent to the information that would be obtained by an actual demonstration, compliance with the emergency evacuation requirement must be shown by actual demonstration using FAA test criteria and procedures.

The working group found that FAA's process for determining whether or not to conduct a full-scale evacuation demonstration is far too restrictive. The working group recognized that a full-scale demonstration can be useful when FAA needs to determine the evacuation capability of a new, novel, and unique aircraft. However, the working group concluded that the demonstrations should be limited to those aircraft for which FAA-approved test data are not available to support analysis. Also, the working group concluded that (1) the very nature of the current full-scale evacuation demonstration is such that injuries can occur, (2) the test conditions should be revised to

minimize the potential for injuries, and (3) exposure of test subjects should be limited and considered only after all alternative means of obtaining the necessary data have been considered.

Among other things, the working group made specific recommendations to revise the emergency evacuation test criteria and procedures. Also, the working group recommended revising the guidelines for using analysis and tests for emergency evacuation demonstrations in lieu of conducting an actual demonstration. (Enc. II compares the current and proposed emergency evacuation demonstration test criteria and procedures.) The proposed revisions would allow FAA to evaluate the emergency evacuation capability of aircraft either by full-scale demonstration or by a combination of tests and analysis. However, manufacturers and operators would need to conduct a full-scale demonstration only when insufficient test data exist or cannot be obtained by system-level tests and/or a partial demonstration. Although several members expressed concern that the proposed revisions could eliminate full-scale evacuation demonstrations, the Emergency Evacuation Subcommittee adopted the working group's conclusions and recommendations. The working group is currently developing a Notice of Proposed Rulemaking to implement the recommendations.

The Emergency Evacuation Subcommittee did not recommend that the 90-second evacuation demonstration standard be reduced. Although several of the proposed changes would affect the required time limit, the Emergency Evacuation Subcommittee believes that adjustments can be made without revising the standard. For example, if the demonstration is started with the escape slides ready for use and all exits open, the time to perform those actions would need to be added to the demonstration time. This could be done either by adding in the appropriate time after the demonstration is over or, at the beginning of the demonstration, by constraining the availability of the exits until after the specified time has elapsed.

IMPACT ON AIRCRAFT DESIGN IF FAA REDUCED THE 90-SECOND DEMONSTRATION STANDARD

The first requirement for emergency evacuation demonstrations became effective March 1965 and required operators to conduct full-scale evacuation demonstrations

with a time limit of 120 seconds. According to several FAA officials, the 120-second criterion approximated the time for emergency ground crews to reach an aircraft accident. Effective October 1967, FAA required manufacturers to demonstrate that new aircraft could be evacuated in 90 seconds or less and reduced the time limit for the operator's demonstration to 90 seconds. At that time, FAA also required that all transport aircraft be equipped with automatically deployed exit devices within 2 years. According to FAA and industry officials, the reduction of the time limit from 120 to 90 seconds was based on improvements in emergency evacuation slides.

These officials also noted that to reduce the demonstration time to 60 seconds FAA would have to require aircraft to either (1) have more or larger passenger exits to enable the same number of occupants to evacuate in less time or (2) reduce passenger capacity so that fewer people use the existing exits in less time. In requiring these design options for new and existing aircraft, however, FAA would have to consider other important factors, such as the cost-effectiveness of the options and passengers' comfort and attitudes.

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During our review, we discussed emergency evacuation requirements with officials from FAA's headquarters in Washington, D.C., and Transport Airplane Directorate in Renton, Washington. We also monitored the activities of the ARAC Emergency Evacuation Subcommittee and its Performance Standards Working Group, including attending meetings, obtaining internal documents and reports, and discussing key issues with the chairmen of the Subcommittee and the working group.

We have discussed our review with your staffs. As agreed, we plan no further work on this issue until the ARAC Emergency Evacuation Subcommittee completes its work. At that time, we will contact your staffs to determine whether additional work is warranted.

We are sending copies of this correspondence to the Secretary of Transportation; the Acting Administrator, FAA; and the Chairman, ARAC Emergency Evacuation Subcommittee.

Please contact me at (202) 512-2834 if you or your staff have any questions.

Kenneth M. Mead
Director, Transportation Issues

Enclosures - 2

CODE OF FEDERAL REGULATIONS SECTIONS

AFFECTING EMERGENCY EVACUATION

14 C.F.R. PART 25-Airworthiness Standards: Transport Category Airplanes

25.561	General-Emergency landing conditions (particularly para. d)
25.562	Emergency landing dynamic conditions (particularly para. c)
25.772	Pilot compartment doors
25.783	Doors
25.785	Seats, berths, safety belts, and harnesses
25.787	Stowage compartments
25.789	Retention of items of mass in passenger and crew compartments and galleys
25.803	Emergency evacuation
25.807	Passenger emergency exits
25.809	Emergency exit arrangement
25.810	Emergency escape route
25.811	Emergency exit marking
25.812	Emergency lighting
25.813	Emergency exit access
25.815	Width of aisle
25.817	Maximum number of seats abreast
25.853	Compartment interiors
25.1411	General-Safety Equipment
25.1415	Ditching equipment
25.1421	Megaphones
25.1423	Public address systems
25.1541	General-Markings and placards
25.1561	Safety equipment
Appendix F	Various flammability test procedures
Appendix J	Emergency demonstration test criteria and procedures

14 C.F.R. PART 121-Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft

121.285	Carriage of cargo in passenger compartment
121.291	Demonstration of emergency evacuation procedures
121.309	Emergency equipment
121.310	Additional emergency equipment
121.311	Seats, safety belts, and shoulder harnesses
121.312	Materials for compartment interiors
121.313	Miscellaneous equipment

121.318	Public address system
121.391	Flight attendants
121.397	Emergency and emergency evacuation duties
121.549	Flying equipment
121.571	Briefing passengers before takeoff
121.576	Retention of items of mass in passenger and crew compartments
121.577	Food and beverage service equipment during takeoff and landing
121.585	Exit row seating
121.589	Carry-on baggage
Appendix D	Criteria for demonstration of emergency evacuation procedures

COMPARISON OF CURRENT AND PROPOSED EMERGENCY EVACUATION DEMONSTRATION TEST CRITERIA AND PROCEDURES

Current emergency demonstration test criteria and procedures	Proposed emergency demonstration test criteria and procedures
a. The emergency evacuation must be conducted either during the dark of the night or during daylight, with the dark of night simulated. If the demonstration is conducted indoors during daylight hours, it must be conducted with each window covered and each door closed to minimized the daylight effect. Illumination on the floor or ground may be used, but it must be kept low and shielded against shining into the airplane's window or doors.	a. The emergency evacuation may be conducted during daylight conditions.
b. The airplane must be in a normal attitude with landing gear extended.	b. No change.
c. Stands or ramps may be used for descent from the wing to the ground, and safety equipment such as mats or inverted life rafts may be placed on the floor or ground to protect participants. No other equipment that is not part of the airplane's emergency evacuation equipment may be used to aid the participants in reaching the ground.	c. Where no assist means are required for descent from the wing to the ground, stands or ramps may be used for descent from the wing to the ground, and safety equipment such as mats or inverted life rafts may be placed on the floor or ground to protect participants. No other equipment that is not part of the airplane's emergency evacuation equipment may be used to aid the participants in reaching the ground.
d. Except as provided in paragraph (a), only the airplane's emergency lighting system may provide illumination.	d. Reserved-Recommended a study to define the light levels for conducting demonstrations.

e. All emergency equipment required for the planned operation of the airplane must be installed.	e. No change.
f. Each external door and exit, and each internal door or curtain, must be in the takeoff configuration.	f. Each internal door or curtain must be in the takeoff configuration.
g. Each crewmember must be seated in the normally assigned seat for takeoff and must remain in the seat until receiving the signal for commencement of the demonstration. Each crewmember must be a person having knowledge of the operation of exits and emergency equipment.	g. No change.
h. A representative passenger load of persons in normal health must be used as follows: 1. At least 30 percent must be females. 2. At least 5 percent must be over 60 years of age, with a proportionate number of females. 3. At least 5 percent, but not more than 10 percent, must be children under 12 years of age, prorated through that age group. 4. Three life-size dolls, not included as part of the total passenger load, must be carried by passengers to simulate live infants 2 years or younger. 5. Crewmembers, mechanics, and training personnel, who maintain or operate the airplane in the normal course of their duties, may not be used as passengers.	h. A representative passenger load consisting of persons in normal health, with 1, 2, & 3. Reserved-Recommended a study to determine an appropriate age and sex mix that would maintain the validity of the 90-second criterion. 4. No change. 5. No change.

i. No passenger may be assigned a specific seat except as the Administrator may require. Except as required by paragraph (g), no employee of the applicant may be seated next to an emergency exit.	i. No Change
j. Seat belts and shoulder harnesses (as required) must be fastened.	j. No change.
k. Before the start of the demonstration, approximately one-half of the total average amount of carry-on baggage, blankets, pillows, and other similar articles must be distributed at several locations in aisles and emergency exit access ways to create minor obstructions.	k. No change.
l. No prior indication may be given to any crewmember or passenger of the particular exits to be used in the demonstration.	l. No change.
m. The applicant may not practice, rehearse, or describe the demonstration for the participants nor may any participant have taken part in this type of demonstration within the preceding 6 months.	m. No change.
n. The pretakeoff passenger briefing may be given. The passengers may also be advised to follow directions of crewmembers but not be instructed on the procedures to be followed in the demonstration.	n. The pretakeoff passenger briefing may be given. The passengers may also be advised to follow directions of crewmembers but not be instructed on the procedures to be followed in the demonstration, except with respect to safety procedures related to logistics of the test site.

ENCLOSURE II

o. If safety equipment as allowed by paragraph (c) is provided, either all passengers and cockpit windows must be blacked out or all of the emergency exits must have safety equipment in order to prevent disclosure of the available emergency exits.	o. The airplane must be properly configured in order to prevent disclosure of the available emergency exits.
p. Not more than 50 percent of the emergency exits in the sides of the fuselage of an airplane that meets all of the requirements applicable to the required emergency exits for that airplane may be used for the demonstration. Exits that are not to be used in the demonstration must have the exit handle deactivated or must be indicated by red lights, red tape, or other acceptable means placed outside the exits to indicate fire or other reason why they are unusable. The exits to be used must be representative of all of the emergency exits on the airplane and must be designated by the applicant, subject to approval by the Administrator. At least one floor level exit must be used.	p. Not more than 50 percent of the emergency exits in the sides of the fuselage of an airplane that meets all of the requirements applicable to the required emergency exits for that airplane may be used for the demonstration. On exits equipped with escape slides the demonstration may be conducted with the escape slides inflated and the exits open, at the beginning of the demonstration. In this case, all exits will be configured such that the active exits are not disclosed to the occupants. If this method is used, the exit preparation time for each exit utilized must be added to the evacuation time of the actual demonstration. Exits that are not to be used in the demonstration must be clearly indicated after the demonstration has started. The exits to be used must be representative of all of the emergency exits on the airplane and must be designated by the applicant, subject to approval by the Administrator. At least one floor level exit must be used.
q. All evacuees, except those using an over-the-wing exit, must leave the airplane by means provided as part of the airplane's equipment.	q. No change.

r. The applicant's approved procedures must be fully utilized during the demonstration.	r. No change.
s. The evacuation time period is completed when the last occupant has evacuated the airplane and is on the ground. Provided that the acceptance rate of the stand or ramp is not greater than the acceptance rate of the means available on the airplane for descent from the wing during an actual crash situation, evacuees using stands or ramps allowed by paragraph (c) are considered to be on the ground when they are on the stand or ramp.	s. No change.

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