DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 25, 121, and 135

[Docket No. 26530, Amdt. Nos. 25-76, 121-228 and 135-43]

RIN 2120-AC46

Improved Access to Type III Exits

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This amendment revises the Federal Aviation Regulations (FAR) to require improved access to the Type III emergency exits (typically smaller over-wing exits) in transport category airplanes with 60 or more passenger seats. These changes are the results of tests that were conducted at the FAA's Civil Aeromedical Institute (CAMI), and are intended to improve the ability of occupants to evacuate an airplane under emergency conditions. They affect air carriers and commercial operators of transport category airplanes as well as the manufacturers of such airplanes.

EFFECTIVE DATE: June 3, 1992.

FOR FURTHER INFORMATION CONTACT: Gary L. Killion, Manager, FAA, Regulations Branch (ANM-114), Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98055-4056; telephone (206) 227-2114.

SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 91-11 which was published in the **Federal Register** on April 9, 1991 (56 FR 14446). In that notice, the FAA proposed amendments to the FAR that would require improved access to Type III passenger emergency exits in transport category airplanes with 20 or more passenger seats.

As defined in § 25.807(a)(3) of part 25 of the FAR, a Type III passenger emergency exit must have an opening that is not less than 20 inches wide by 36 inches high. It need not be rectangular in shape, provided a rectangle of those dimensions can be inscribed within the opening. The corner radii must not be greater than one-third the width of the exit. The step-up distance inside the cabin must not be more than 20 inches. Type III exits are typically over-wing exits; when so located, the step down to the wing must not be more than 27 inches. Type III exits are typically removable hatches; however, they may be hinged or tracked doors.

Although specific passageways are not currently defined, access from each aisle to each Type III exit is required by § 25.813(c). Additionally, § 25.813(c) requires, for airplanes with 20 or more passenger seats, that the projected opening of the Type III exit may not be obstructed and that there must be no interference (e.g. by seats, berths, etc.) in opening the exit. For airplanes with 19 or fewer passenger seats, there may be minor obstructions in this region if there are compensating factors to maintain the effectiveness of the exit.

In September 1985, the FAA convened a Public Technical Conference on Emergency Evacuation of Transport Airplanes in response to issues raised by various sectors of the public regarding the adequacy of existing regulations involved with emergency evacuation. One of the issues discussed was access to Type III exits. As a result of questions posed at this conference, a series of tests was conducted by CAMI to evaluate the ease with which exits can be opened and the effect of passageway width on flow through them. The CAMI report, No. DOT/FAA/AM-89/14—The Influence of Adjacent Seating Configurations on Egress Through a Type III Emergency Exit, is available from the National Technical Information Service, Springfield, Virginia 22161. In addition, a copy of the report is included in the docket for this rulemaking proceeding. As described in the report, the first set of tests was run with a total of 131 subjects—three groups of 33 each and one group of 32. The evacuation rates of the four groups evacuating through a Type III exit were measured in these tests. Each group was tested in four separate runs, passing through four diffent access configurations on their way to the exit. This set of tests used the principles of Latin Square testing. (The Latin Square test, which is defined in FAA Order FS 8110.12, dated May 21, 1964, is a procedure used in evaluating two or more different exit configurations. It is used to factor out differences in test subject groups and experience gained by the groups in succeeding test runs.) The four access configurations were:

A—the current minimum access required by § 25.813(c), which resulted in an unobstructed passageway of approximately 6 inches;

B—a configuration which had a minimum of 10 inches of unobstructed passageway to the exit, with the leading edge of the seat botton cushion of the row of seats aft of the exit located on the centerline of the exit (see Figure 1);

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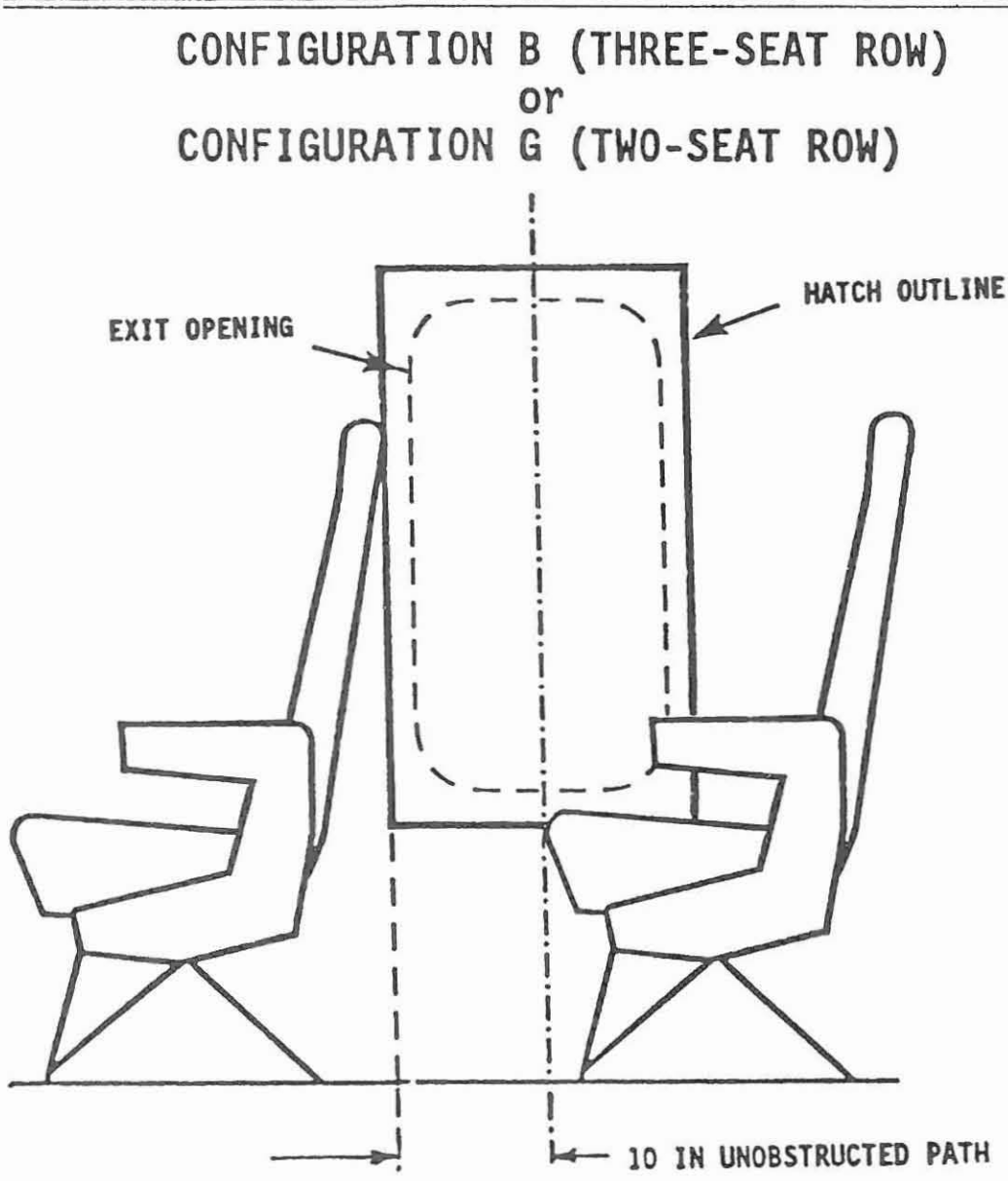

Figure 1

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C—a configuration which had a minimum of 20 inches of unobstructed passageway to the exit, with the leading edge of the seat bottom cushion of the row of seats aft of the exit protruding 5 inches forward of the projected aft vertical edge of the exit opening (see Figure 2);

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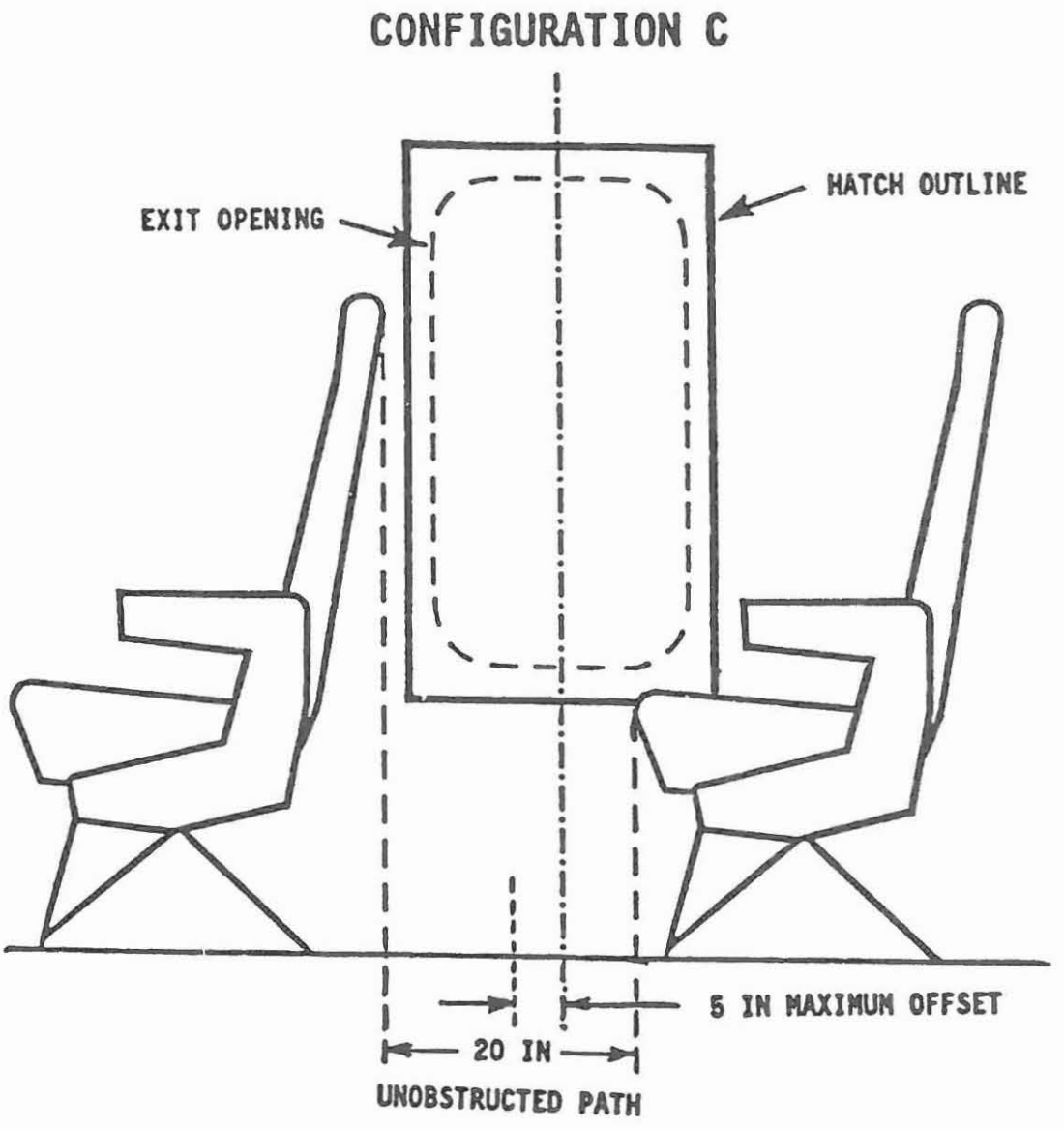

Figure 2

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and

D—a configuration with a seat row centered on the exit, with the outboard seat of that row deleted, and with the seat rows forward and aft of this seat row spaced at 32 inches to provide two. approximatley 6-inch, unobstructed passageways to the exit (see Figure 3). As discussed below under "Discussion of Comments," some commenters are under the erroneous impression that Configuration C was tested with a much narrower passageway to the exit.

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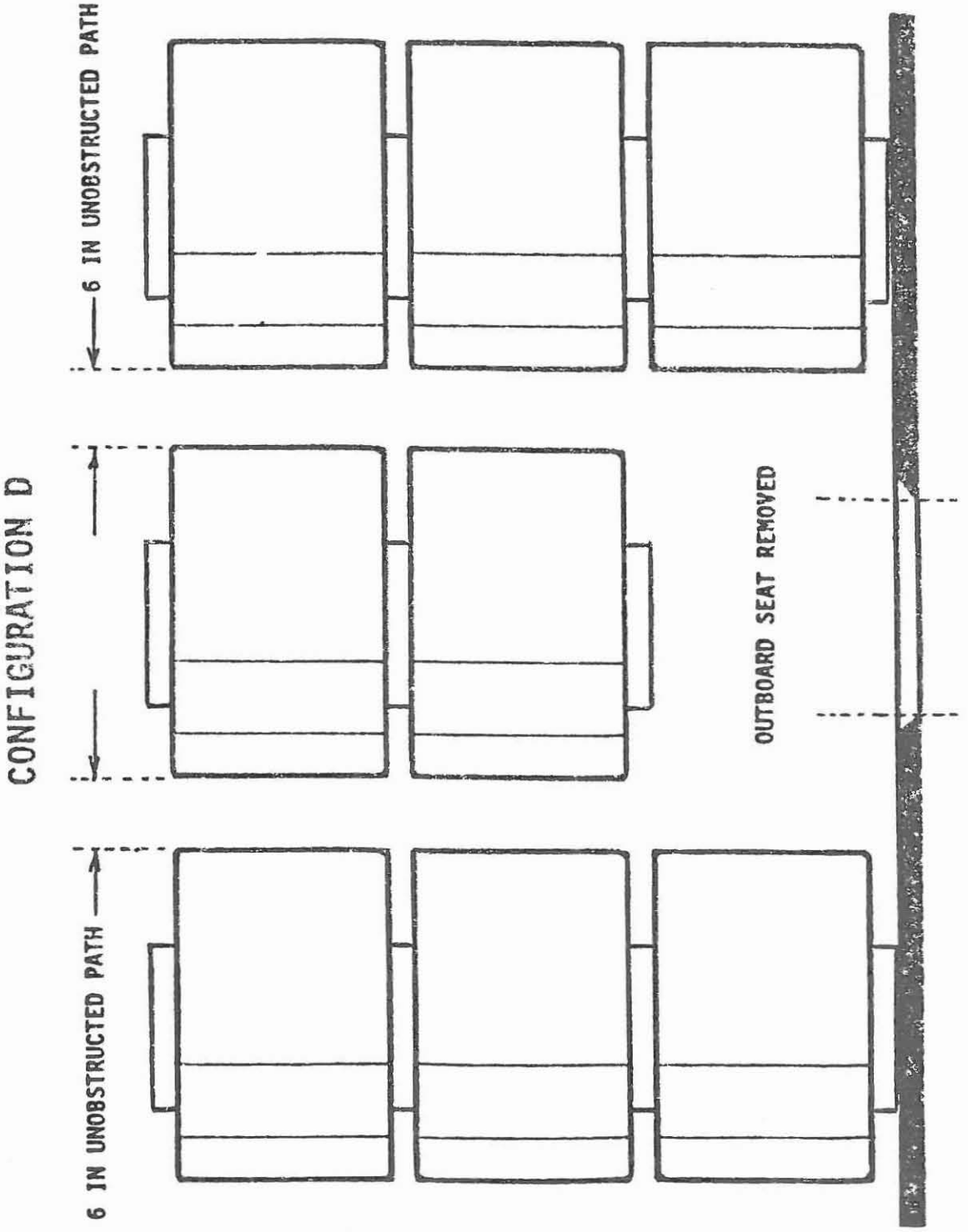

Figure 3

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Each of the above configurations simulated cabin interiors with three seats per row and one Type III exit per side.

The data obtained from these tests were then subjected to a statistical evaluation. It was found that the egress rates of Configurations C and D were approximately 14 percent better than that of Configuration A, a statistically significant improvement. In addition, the rate of egress from Configuration D was a statistically significant improvement over that of Configuration B.

The exit preparation time, i.e., the time it took to open and dispose of the exit hatch, was measured in the second set of tests. During this testing, each of five seating locations (Configuration D has two seating locations from which a person can reasonably be expected to open the exit) was evaluated with eight subjects per location. In this set of tests, the questions of where to dispose of the hatch and whether or not increased work space in the vicinity of the exit would reduce the amount of time required to prepare the exit for use were studied. Any instruction as to what to do with the exit hatch after it had been removed from the side of the fuselage mockup was intentionally omitted from the passenger information card during the testing. This was consistent with some airline passenger information cards that do not recommend specific stowage areas. As expected, the test subjects found a variety of solutions to the question. These included laying the hatch horizontally or vertically against the back of the seat row forward of the exit or vertically in the seat position that the opener had previously occupied, throwing the hatch out the exit, and placing the hatch on the seat row forward of the exit. In some instances, the hatch was stowed in a position considered to be a possible impediment to the smooth flow of passengers to and through the exit.

The tests conducted by CAMI showed that a significant improvement in egress rates could be achieved by increasing the access space to Type III exits over that currently required by Part 25. Notice 91–11 proposed to amend § 25.813(c) to require increased access to Type III exits from the nearest main aisle on airplanes with a seating configuration of 20 or more. The rule proposed in that notice would require that passageways be provided as described in either test configuration C or D, which are defined in proposed §§ 25.813(c)(1) (i) and (ii), respectively. These passageways are projected vertically with respect to the airplane floor.

As proposed, current §§ 25.813(c) (1) and (2) would be reidentified as §§ 25.813(c)(2) (i) and (ii). This relocation would clearly show that these requirements are separate from the passageway requirements of proposed §§ 25.813(c)(1) (i) and (ii). This would also clearly show that the phrase "this region" in proposed § 25.813(c)(2)(ii) refers to those areas discussed in proposed § 25.813(c)(2)(i). The phrase "excluding pilot's seats" would be removed because the reader may incorrectly interpret the sentence to mean that the seats of other crewmembers, such as those of flight attendants or flight engineers, are considered to be passenger seats.

When the exit is a removable hatch (as opposed to a hatch or door that remains attached to the fuselage), a placard would also be required to clearly indicate the method of opening the hatch and to recommend at least one stowage location. This would reduce the probability that the hatch would be left in a position that would hamper the flow to the exit. Where the hatch should be stowed in a specific airplane model would depend on the configuration of the interior and exterior in the vicinity of the exit.

Additionally, the weight of the hatch would also have to be indicated on the placard. This proposed requirement is a result of observation during the second set of tests that subjects were often overwhelmed by the unexpected weight of the exit hatch. In most instances, they would have been better prepared and positioned to handle the hatch had they known its weight beforehand.

As proposed, the placard would have to be located in a prominent position in front of each seat that both faces and borders the passageways from the cabin aisle to the exit. The passengers in these seats are the most likely to open the exits in an emergency because of their proximity to the exits. In the case of a Configuration D arrangement, this would typically include the passengers in the seat assembly centered on the exit and the passengers in the row aft of the exit. The requirement for the placard was proposed for § 25.813(c) rather than § 25.807(a)(3) because proper disposal of the hatch is an important factor in maintaining access to the exit.

For multi-aisle airplanes, an unobstructed 20-inch cross-aisle would be required between the main aisles in the vicinity of each Type III exit, except that one cross-aisle may serve two Type III exits that are within three passenger seat rows of each other. Cross-aisles are currently required for Type A, Type I, and Type II exits by § 25.813(a). Section 25.813(a) would be revised to require that cross-aisles be provided for all exit types in multi-aisle airplanes. The cross-aisle would be required to lead directly to the passageway for a Type A exit, which must have two flows of evacuees in order to be fully utilized. For Type I, Type II, and Type III exits, which require only one flow of evacuees in order to be fully utilized, the cross-aisle would have to lead to the immediate vicinity of the exit passageway. For purposes of this rulemaking, "immediate vicinity" means having at least a 5-inch overlap of the cross-aisle and the passageway to any Type II or larger exit and being within the distance of one passenger seat row (at the smallest seat pitch installed in the airplane) from the passageway for a single Type III exit. When two Type III exits are located within three passenger seat rows of each other, one cross-aisle would suffice for both exits. The cross-aisle would have to be located between the two passageways to the exits. This would eliminate the possibility that evacuees using the cross-aisle would have to bypass one Type III exit to get to the other.

It was also proposed that § 121.310(f)(3) would be amended to require improved access to Type III exits within 6 months after the effective date of the final rule for all airplanes type certificated after January 1, 1958, and operated under part 121. Compliance is not considered practical for airplanes type certificated prior to January 1, 1958, because of their relatively advanced age and small numbers remaining in service. From a practical standpoint, the date January 1, 1958, means that the proposed rulemaking would apply to all turbine-powered transport category airplanes operated in passenger service under part 121, except for any Convair 240/340/440 (580, 600 and 640 conversions thereof), Vickers Viscount, and certain Fokker F–27 airplanes. Few, if any, of these older airplanes remain in such service. The FAA proposed a 6-month compliance period because, given the relative ease of reconfiguring transport category airplane seat arrangements, that would provide sufficient time in which to develop engineering plans for the required change, procure the necessary parts, and reconfigure the airplanes. The proposed compliance period was based on the assumption that affected operators would elect to comply by changing seat pitch or removing a seat adjacent to the Type III exit.

Section 135.177 presently incorporates the provisions of § 121.310 by reference. It has come to the attention of the FAA

that the practice of incorporating certain provisions of part 121 in part 135 by reference may cause confusion. In order to preclude any confusion in this regard, the provisions of § 121.310, including the changes proposed in Notice 91–11, would be included in part 135 explicitly rather than by reference.

While the CAMI tests and the proposed rules focus upon increased access to Type III exits in the area directly adjacent to such exits, the FAA noted that it would also consider alternative means of increasing the flow rate from Type III exits. In that regard, the FAA proposed to accept any alternative seat configuration, exit procedure, or other change that would accomplish an equivalent improvement in the flow rate. As proposed, an air carrier or manufacturer desiring to use such an alternative would be expected to establish, through a test procedure acceptable to the Administrator, that the alternative achieves a level of safety equivalent to that which would be provided by the proposals for an improvement in passenger evacuation through Type III exits, and that the airplane continues to comply with all other applicable regulatory requirements. The FAA requested comments on the desirability of employing this alternative methodology.

Other Tests

In anticipation of questions that would be raised concerning possible alternative configurations, the FAA conducted another series of flow rate tests to obtain comparative data for additional configurations. In order to ensure that FAA resources were not wasted testing configurations that were unusable for other reasons, the suggestions of the Airline transport Association of America (ATA) were obtained at a meeting held June 25, 1991. The discussion at that meeting was limited to possible alternative configurations; discussion concerning the merits of the proposed rulemaking was neither entertained nor permitted. As a result of the discussion, it was concluded that a planned test of a configuration similar to Configuration C except for an 18 inch passageway would be unproductive.

Using test methods similar to those utilized earlier for Configurations A, B, C, and D, CAMI conducted the additional series of tests during the week of August 12, 1991. The four configurations tested in this series were:

E—for comparative purposes, the same as Configuration C of the earlier series, i.e., a configuration that had a minimum of 20 inches of unobstructed passageway to the exit, with the leading edge of the seat bottom cushion of the row of seats aft of the exit protruding 5 inches forward of the projected aft vertical edge of the exit opening (see Figure 2);

F—configuration similar to Configuration E, except that the leading edge of the seat bottom cushion of the row of seats aft of the exit protruded 10 inches forward of the projected aft vertical edge of the exit opening (i.e., at the projected centerline of the exit), the seatbacks of the row of seats ahead of the exit were fixed in a broken-forward position 15 degrees forward of vertical, and the row of seats ahead of the exit was moved aft to reduce the unobstructed passageway to 10 inches (see Figure 4);

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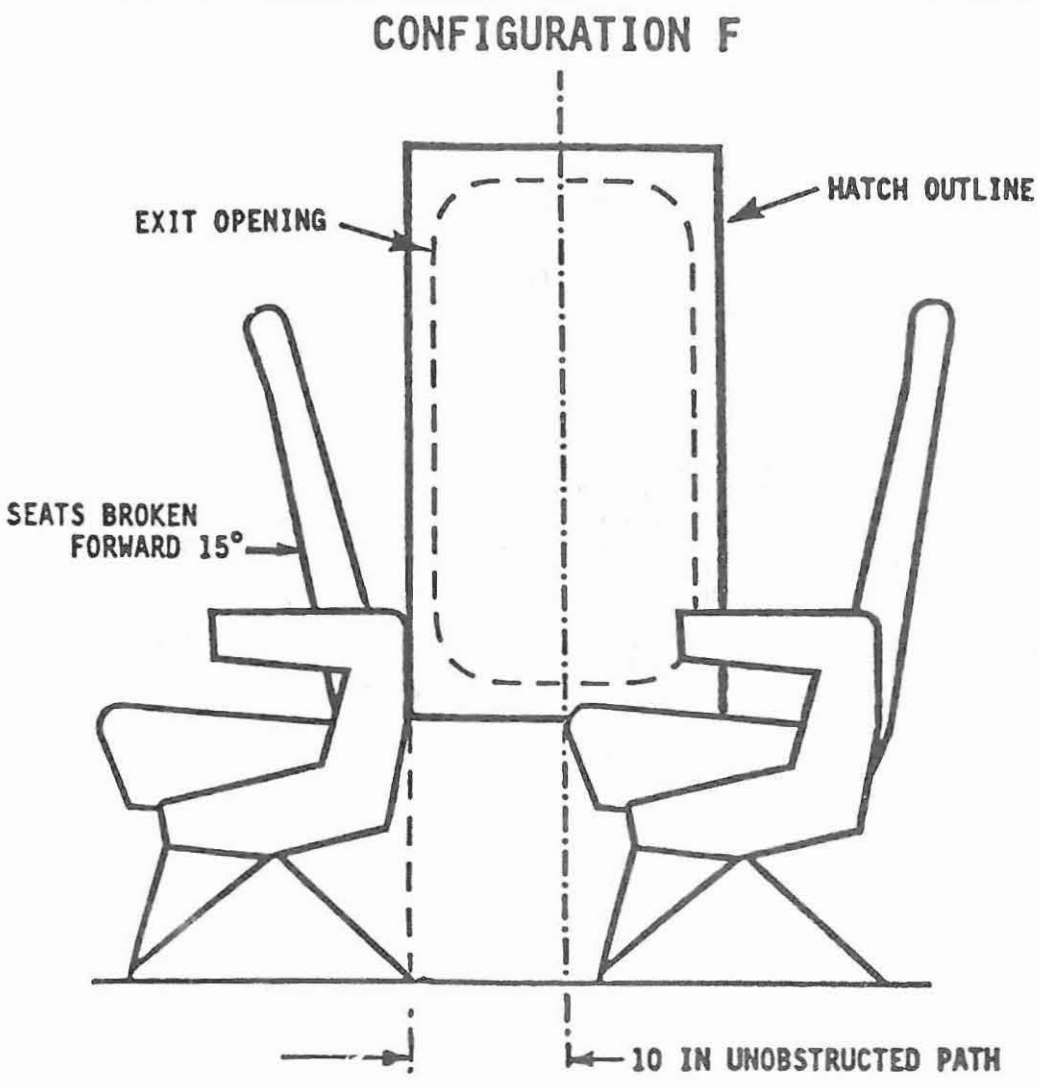

Figure 4

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G—a configuration similar to Configuration B of the earlier tests (i.e., a minimum of 10 inches of unobstructed passageway to the exit with the leading edge of the seat bottom cushion of the row of seats aft of the exit located on the centerline of the exit), except that the seat rows on the exit side of the aisle contained only two seats each (see Figure 1); and

H—a variation of Configuration D of the earlier tests (i.e., a seat row centered on one exit with the outboard seat deleted to provide two approximately 6 inch unobstructed passageways) in which there were two adjacent exits with their vertical centerlines spaced 29 inches apart and two outboard seats removed to provide three approximately 6 inch unobstructed passageways (see Figure 5).

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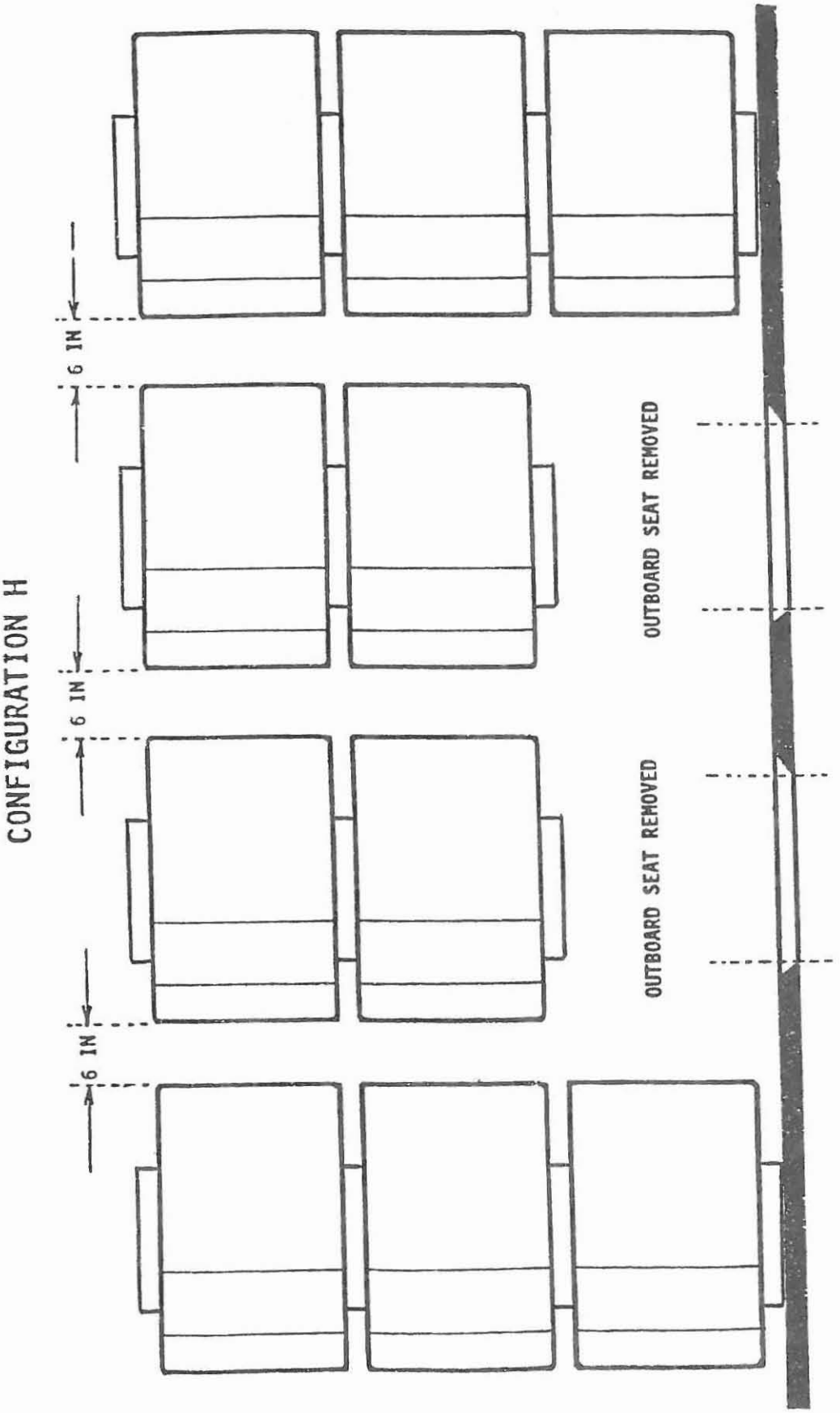

Figure 5

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The details and results of this second test series are contained in CAMI draft report, Effects of Seating Configuration and Number of Type JII Exits on Emergency Aircraft Evaluation. (The above test configurations are identified in a preliminary draft of this memorandum as Configurations A through D, respectively; however, they have been reidentified as Configurations E through H, respectively, in order to preclude confusion with Configurations A through D of the first test series.)

As noted earlier, Configuration C (or Configuration E of the second series) provided the most efficient egress of the configurations tested with three-seat rows. The test results show that the efficiency of configuration G, with a 10-inch passageway and only two seats per row on the exit side of the aisle, was only about ½ per cent less than those with Configuration C. From a test standpoint, ½ per cent is insignificant. Configuration G may therefore be considered equivalent to Configuration C. Configuration F, with a 10-inch passageway and the seatbacks broken forward, provided the least efficient egress of the configurations tested in this second test series—approximately 7 per cent more time per passenger.

Since the issuance of Notice 91-11, it has been brought to the attention of the FAA that configurations involving two adjacent exits on each side of the fuselage present particular problems. Some airplanes, including Douglas DC-9/MD-80 series, Boeing 737-400, certain Boeing 757 series, certain Fokker F-28 series and Airbus A-320 series have adjacent exits with exit centerlines separated by as little as 29 inches. In those airplanes, the exits are located so close together that the row between the two exits cannot be moved in either direction without blocking one of the exits (see Figure 6).

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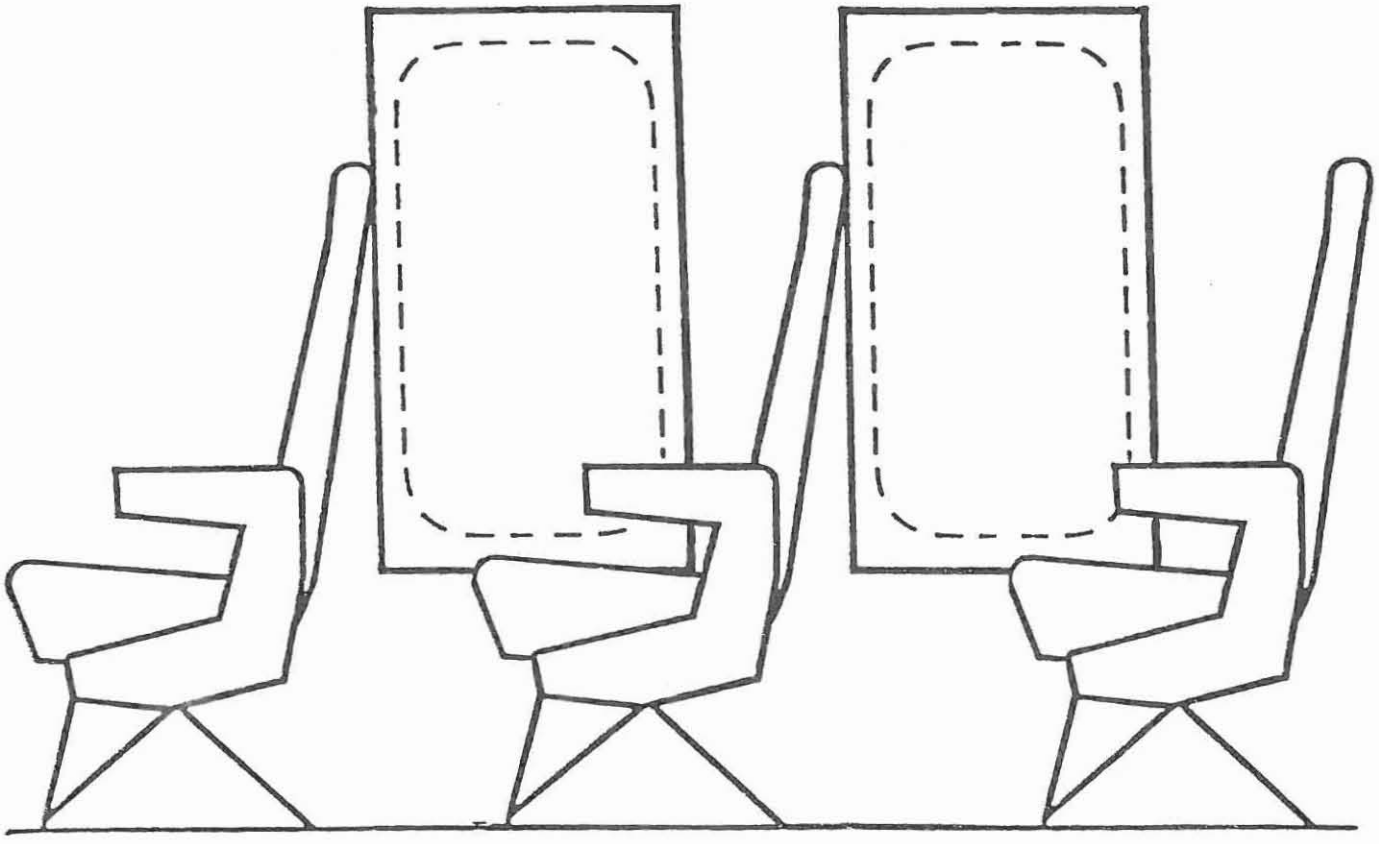
TYPICAL PRESENT DAY CONFIGURATION
with
ADJACENT EXITS



DOUGLAS DC-9/MD-80 SERIES
BOEING 737-400
BOEING 757 (one of three configurations in service)
BOEING 767
FOKKER F-28-4000/F-100
AIRBUS A320

Figure 6

BILLING CODE 4910-13-C

Configuration C, with a 20-inch passageway, is not an available option because moving the row between the two exits aft to obtain the 20-inch passageway at the forward exit would block the other exit (see Figure 7).

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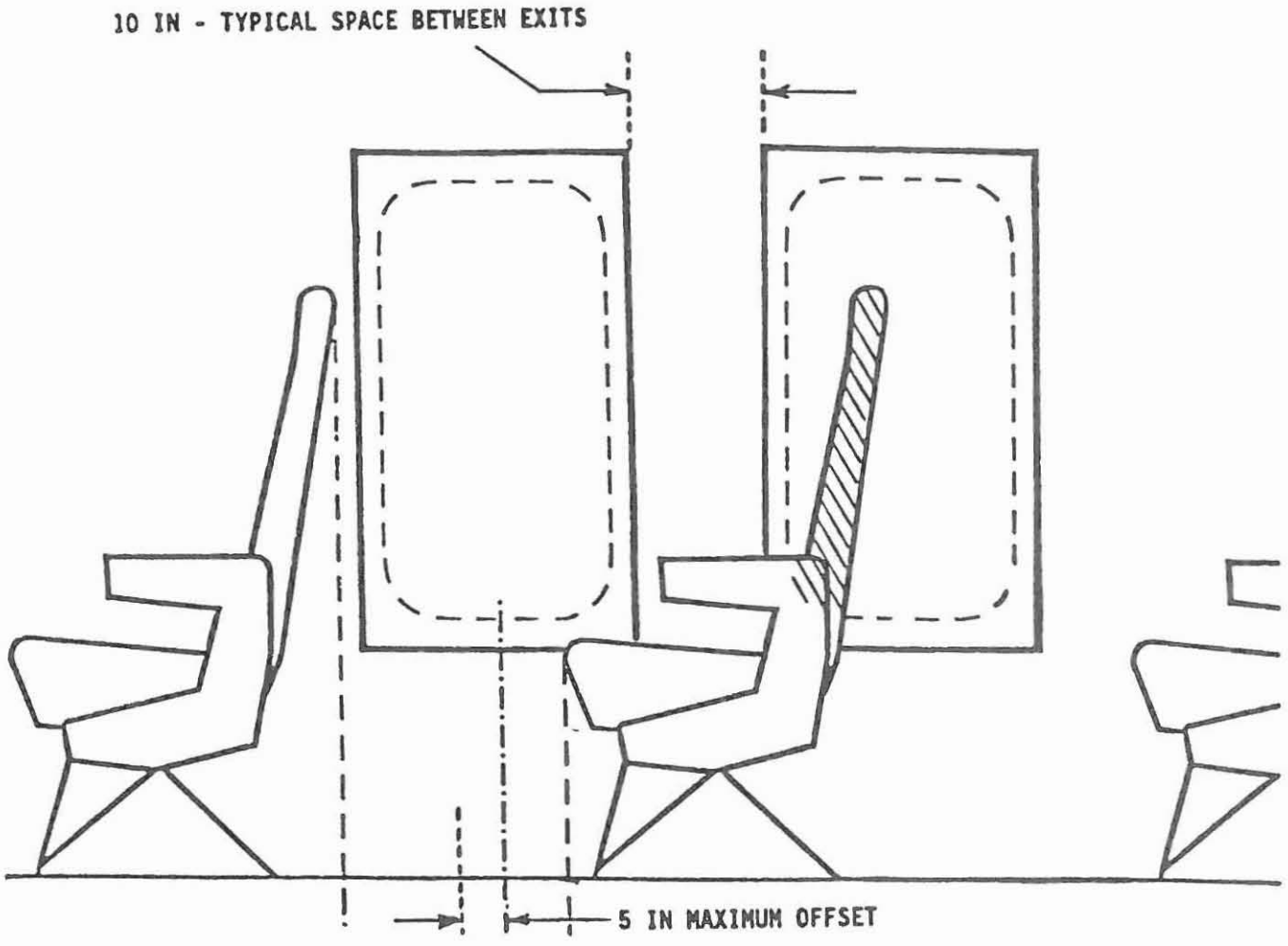

WHY CONFIGURATION C CAN'T BE USED
with
ADJACENT EXITS

Figure 7

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Similarly, advancing the row ahead of the forward exit to provide the 20-inch passageway would result in a misalignment of the passageway and exit centerlines considerably greater than 5 inches, as specified in the Notice (see Figure 8).

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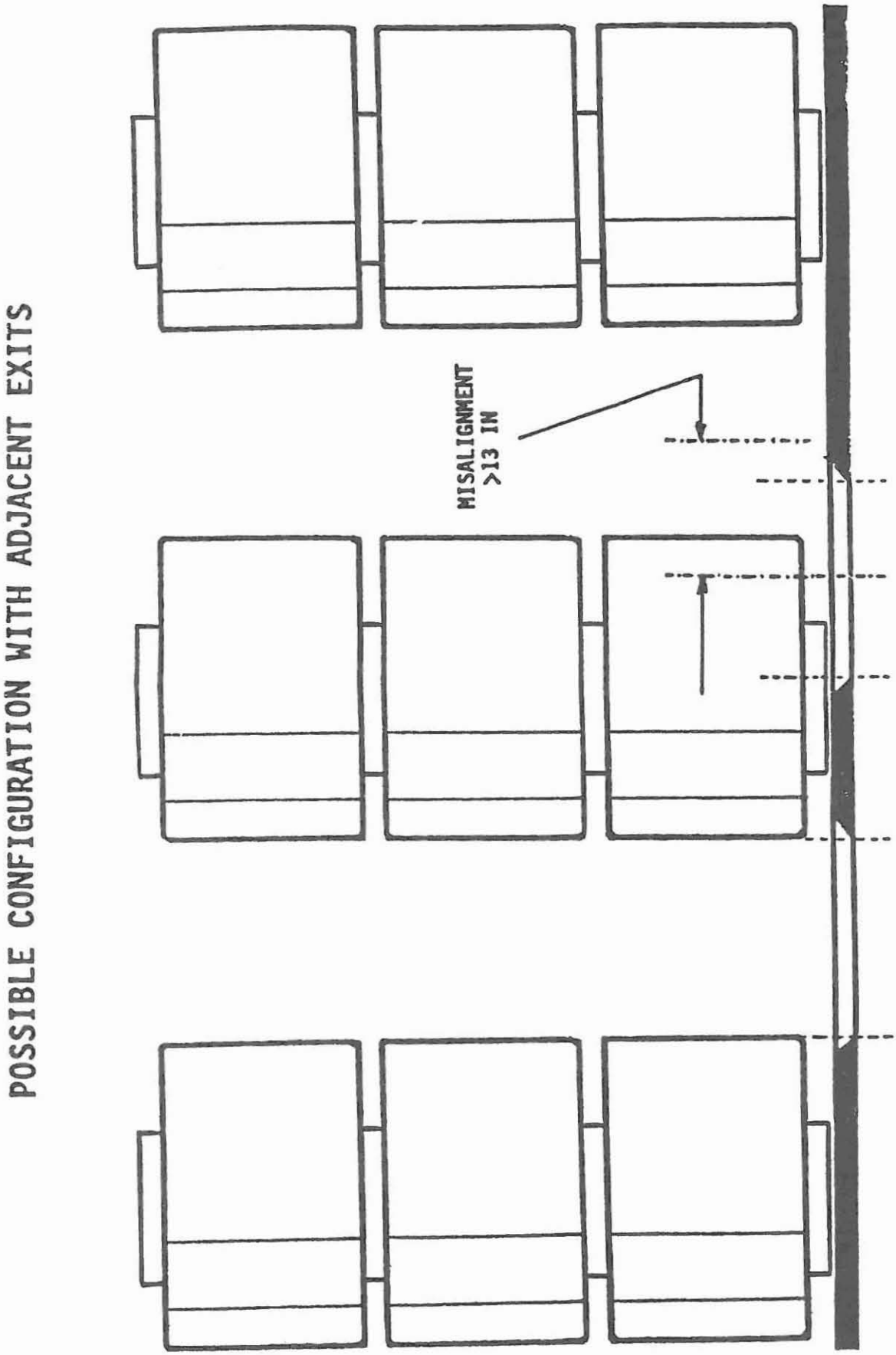

Figure 8

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There was also concern that a variation of Configuration D with the outboard seat removed at each exit to provide three approximately 6-inch passageways would not provide the desired improvement. That variation was therefore included in the second test series as Configuration H (Figure 5).

Egress was considerably slower with Configuration H than with the baseline Configuration C (Configuration E) or the previously-tested Configuration D. Egress time per person was approximately 9 percent greater from the aft exit of Configuration H than that achieved with Configuration E. The time was even worse, approximately 19 percent greater, from the forward exit of Configuration H. This degradation of egress was due both to increased time required to remove the exit hatches and for passengers to flow through them. Unlike Configuration D, there was no test subject seated within arms length of the aft hatch. It was therefore necessary for subjects seated in the rows with the outboard seats removed to lean over or get out of their seats to remove the exit hatches. The average time for each test subject to egress was also increased by the reduction in passageway width (three such passageways were feeding two exits rather than two passageways feeding one exit as in Configuration D) and by test subject hesitancy at the exit hatch openings. The hesitancy seemed to be due to confusion as to "who should go next" when two lines of evacuees converged at one exit. In view of this test series, it does not appear that Configuration H provides any improvement in egress over Configuration A, the current minimum access required by § 25.813(c), whenever there are two adjacent exits in each side. As a result of these tests, it may be concluded that the only way to achieve the improvement in flow intended by Notice 91-11 when there are two adjacent exits is to separate the exits and adopt Configuration C or D at each exit.

A number of commenters referred to tests conducted earlier in the United Kingdom. In 1987, the Civil Aviation Authority of that country commissioned Cranfield Institute of Technology to conduct research concerning passenger behavior in aircraft emergencies. The primary objective of this research was to investigate the influence of changes in access to emergency exits on the passenger evacuation rates. The tests were conducted under two circumstances: (a) when passengers are competing to evacuate an aircraft, as could happen in an accident in which the cabin conditions become life-threatening, and (b) when passengers are evacuating in an orderly manner, as occurs in aircraft certification evacuations and in some accidents. The former circumstance (generally referred to as the "competitive tests") was simulated by offering a significant bonus in pay to the first half of the volunteer evacuees to leave the aircraft. No bonus was offered for the other tests. The test configurations included a range of widths for the passageway through a bulkhead leading to floor-level exits and a range of seating configurations adjacent to a Type III exit. The competitive tests involving access to floor-level exits are not pertinent to this rulemaking; however, those involving access to Type III exits are directly related. Those tests included a configuration similar to Configuration C, except that the unobstructed width of the passageway to the exit differed, and another similar to Configuration D.

From the tests involving access to Type III exits, the researches concluded that:

1. Changes in the unobstructed width of the passageway leading between the two seat rows influence the speed of the evacuation. When a configuration similar to Configuration C is used, the optimum unobstructed width of the passageway is between 13 inches and 25 inches. Although a specific width of 20 inches was not tested, the results of these tests are generally consistent with the CAMI tests using Configuration C (or Configuration E of the later test series).

2. When the unobstructed width of the passageway is further increased by completely removing one seat row, the evacuation flow rate is slower than that achieved when the unobstructed width is between 13 and 25 inches.

3. A configuration similar to Configuration D provides a rapid evacuation flow rate but is prone to blockages. In addition, opening and disposing of the exit was found to be more difficult with that configuration.

In these tests, the behavior that results from monetary incentive was used to represent the competitive behavior that would result from mortal fear in an actual emergency. Since this representation may not be completely accurate, the FAA is not prepared to accept the validity of the "competitive tests" in their entirety. Nevertheless, the above conclusions cannot be ignored. In particular, the competitive behavior tests show that providing additional space adjacent to an exit may not improve the evacuation flow rate and may, in some instances, actually prove to be counterproductive.

Discussion of Comments

Nearly 200 commenters responded to the invitation extended in Notice 91-11. These include responses from the general public, airplane manufacturers and associations representing them, airlines and associations representing them, the City of Los Angeles, foreign airworthiness authorities and associations representing airline employees.

The vast majority of the commenters are members of the general public. Fifty such commenters support the proposed rulemaking without further comment. Forty-seven others support the proposed rulemaking, but offer additional comments or suggestions. None of the commenters from the general public present factual information to support their beliefs. Some appear to believe that the cost of the proposed rulemaking would simply come out of airline profits; however, a significant number support the rulemaking even though they recognize that they, the consumers, would ultimately bear the cost of compliance.

Some persons make no specific comment concerning the proposed rulemaking, but simply complain that the interiors of commercial airliners are too crowded. One expresses concern about stowage of heavy baggage in overhead compartments. Another alleges that food service and lavatories are unhygienic. These comments go well beyond the scope of the present rulemaking and cannot be considered at this time. To the extent that they have merit, the FAA will consider them for future proposed rulemaking.

A number of commenters make comments that are relevant, although well beyond the scope of the proposed rulemaking. Several focus on the capability of the passengers seated adjacent to the emergy exits. In general, those commenters believe that the persons sitting next to the exits must be able-bodied, in sound mental condition, fluent in the English language, and neither elderly, handicapped, nor traveling with small children. Some suggest that only persons certified as competent to operate the exits should be permitted to sit in those seats.

The FAA agrees that the persons seated adjacent to the emergency exits should be capable of opening them expeditiously. In that regard, the FAA adopted Amendment 121-214 (55 FR 8054, March 6, 1990) which requires that only persons who are determined by the certificate holder to be able, without assistance, to activate an emergency exit and to take the additional actions

needed to ensure safe use of that exit in an emergency may be seated in exit rows. In light of the action already taken, the need for and practicality of adopting these suggestions has not been clearly established.

Other commenters suggest that mockups of the emergency exit arrangement should be provided at the airport so that passengers could familiarize themselves with the exit operation before boarding. Providing for airport mockups goes well beyond the scope of Notice 91–11 and cannot be adopted at this time; however, it would be proposed in future rulemaking it if were determined to have sufficient merit.

Some commenters believe that the size or number of Type III exits should be increased. It has been demonstrated that the ability of persons to egress through certain larger floor-level exits could be enhanced by modestly increasing the size of those exits (i.e., not so much that they could qualify as the next larger type). The FAA has therefore proposed to define two additional types of floor-level exits (Notice 90–4, 55 FR 6344, February 22, 1990). Unlike those proposed enhanced floor-level exits, the FAA is not aware of any data showing that the ability of persons to egress through Type III exits could be enhanced significantly by increasing their size. Similarly, there is no evidence that the number of Type III exits specified by § 25.807 for various seating configurations is insufficient. In any event, those suggestions go beyond the scope of Notice 91–11 and cannot be considered at this time.

Two commenters, both foreign airworthiness authorities, recommend that the rulemaking should include improving the integrity of seatback tray table latches to preclude inadvertent deployment of the tables during evacuation. While this recommendation may have merit, it goes beyond the scope of Notice 91–11 and cannot be considered at this time. If it is determined that failure of tray table latches has impeded previous evacuations under emergency conditions, this recommendation will be considered for future rulemaking action.

The same commenters recommend that the bottom structure of the seats adjacent to the exit access should be designed to minimize the possibility of limb entrapment. This recommendation also goes beyond the scope of Notice 91–11 and must therefore be deferred for consideration in future rulemaking.

Those commenters and a number of others recommend that, for rows bordering the passageway to a Type III exit, the seatback should be designed so that motion is limited to ± 15 degrees when a force as great as 400 pounds is applied to the seatback. The purpose of limiting seatback motion would be to discourage evacuees from finding multiple alternate routes to the exit and cause blockage. Like the above two recommendations, this also goes beyond the scope of Notice 91–11 and cannot be considered at this time. If it is deemed to have sufficient merit, it will be considered for future rulemaking.

One commenter believes that proposed § 25.813(c)(1) is not clear to whether reclined seat backs can protrude into the 20-inch passageway leading to the Type III exit. The FAA concurs that there may be confusion in this regard; therefore, § 25.813(c)(1)(i) contains the following additional sentence, "The width of the passageway must be measured with adjacent seats adjusted to their most adverse position." A similar clarification has been added to § 25.813(c)(1)(ii). In order to minimize the loss of cabin space, operators will probably provide means to limit seat back recline adjacent to the passageway.

As proposed, § 25.813(c)(1)(i) would permit the centerline of the passageway to be displaced as much as 5 inches horizontally from that of the exit. Two commenters do not believe that any displacement of the centerlines should be permitted. The FAA does not concur. The tests have shown that a displacement of 5 inches does not adversely affect egress, and not permitting any displacement would impose an unnecessary design constraint. On the contrary, it is noted that a maximum displacement of 5 inches may be unduly restrictive when the width of the passageway is greater than the minimum of 20 inches. The centerline of the passageway could be offset more than 5 inches, without any degradation of the egress capability, provided the centerline of a 20-inch wide portion of the passageway is not displaced more than 5 inches from that of the exit. Section 25.813(c)(1)(i) is therefore adopted as proposed, except that it specifies that the centerline of the required 20 inch width must not be displaced more than 5 inches horizontally from that of the exit.

One commenter believes that the overhead stowage compartment should be removed from above Type III exits in order to provide more head room. This, too, is beyond the scope of Notice 91–11; however, it does not appear that it would serve any useful purpose. As noted above under **"Background,"** § 25.813 requires the underside of the stowage compartment to be no lower than the upper edge of the exit. Evacuees would have to lower their heads to clear the upper edge of the exit regardless of the presence of a stowage compartment.

A number of commenters, including foreign airworthiness authorities, support the proposal to require unobstructed 20-inch wide access passageways (Configuration C—Figure 2), but not the alternative of removing the outboard seat adjacent to the exit (Configuration D—Figure 3). In contrast, others support the proposal to require removal of the outboard seat, but not the alternative of providing an unobstructed 20-inch wide passageway. Commenters with these opposing points of view cite the same competitive behavior tests to support their positions.

The FAA has carefully reviewed the results of both the competitive behavior testing and the testing conducted by CAMI. Contrary to the views of one group of commenters, both the competitive behavior tests and the CAMI test clearly show that Configuration C (Figure 2) is a viable means to improve the egress of passengers through Type III exits. The opposing point of view presented by the other group is more difficult to assess.

Configuration D (Figure 3) offers the advantage of providing more room in which a passenger may maneuver to remove and dispose of the hatch. Furthermore, the egress rate provided by that configuration in the initial CAMI tests was very good. Additionally, Configuration D offers redundant paths to the exit. On the other hand, competitive behavior tests show that it may be prone to blockages under actual emergency conditions. The CAMI testing of Configuration H appears to confirm the possibility that blockages, or at least delays due to confusion as to "who goes next," may occur whenever there is room enough for more than one orderly file of evacuees leading to the exit. The FAA also concurs with commenters that the removed hatch might be left in the space created by removal of the outboard seat and seriously hinder the flow of evacuees. In consideration of the competitive test results and comments received, it appears that Configuration D may not be as beneficial as Configuration C. A number of operators do, in fact, already have airplanes in service with that configuration. The final rule will allow the option of using Configuration D.

A number of commenters do not concur that either alternative would be sufficient and believe that the entire exit seat row should be removed. Although this would intuitively appear to be an improvement, the competitive behavior

testing has shown that the results could actually be counterproductive if the entire row were removed.

Two commenters believe that only outward opening doors should be allowed. The FAA does not concur with those commenters. The exits of transport category airplanes are typically designed so that they can be opened only to the inside in order to preclude a catastrophic decompression of the cabin should there be a failure of the exit retention system. (Some exits that appear to be outward opening actually open inward, then rotate in order to pass through an opening that is smaller than the exit.) Since that potential hazard would far outweigh the possible benefits of outward opening exits, the FAA does not consider it appropriate to require the use of such exits. In a similar vein, another commenter believes that the Type III exit hatches should be lighter in weight. The FAA certainly concurs that the hatches should be as light as possible. Nevertheless, the structural strength needed to prevent a catastrophic failure of the hatch must be the primary consideration.

Some commenters believe that the required exit placarding should instruct the person opening the hatch to place it outside the airplane. The FAA concurs that this would generally be more desirable than leaving it inside the cabin. There may, however, be unique installations in which placing the hatch outside the airplane might interfere with passengers' escape from the airplane or damage escape means (e.g. inflatable slides, etc.). It is therefore not considered appropriate to adopt specific requirements to dispose of the hatch outside the airplane.

One commenter believes that the phrase "stow the hatch" in proposed § 25.813(c)(3)(iii) implies that there must an approved pre-determined location for disposing of the exit. The FAA concurs that "stow the hatch" may convey this implication; therefore, § 25.813(c)(3)(iii), as adopted, reads, "If the exit is a removable hatch, state the weight of the hatch and indicate an appropriate location to place the hatch after removal."

One commenter, an organization representing airline employees, does not concur that airplanes with seating for 19 or fewer passengers should be excepted from the access requirements as proposed. In contrast, a number of other commenters take the opposite position. Those commenters note that operators of smaller airplanes would be adversely affected by the the proposed new standards more than those of the larger airplanes. One estimates that the loss of seats would only be approximately 0 to 2.5 percent for large wide-body airplanes while that for smaller airplanes would be as much as 10 percent. The commenters believe that, in airplanes with passenger capacities of 50–60 or fewer, the distribution and dimension of the cabin has already been optimized during initial design to ensure easy and quick evacuation. The commenters note that the passenger-exit ratio is always much less in such airplanes and that, due to the shorter cabin length, all passengers are close to an exit. The commenters also note that the typical seat pitch of such airplanes is 29–31 inches and that it is impossible to reduce the seat pitch without causing a higher risk of injury and decreasing the comfort of passengers to unacceptable levels. The commenters therefore conclude that there is no way to gain the additional access space other than by removing seats. Because it would be extremely costly and there are few potential benefits, the commenters recommend that airplanes with more than 19 passengers should not be required to comply. Some suggest that airplanes with as many as 108 passengers should be excluded.

The FAA concurs that there has not been a demonstrated need to provide additional access to the Type III exits used in the smaller transport category airplanes. This, no doubt, is due in large part to the much more favorable passenger-exit ratio required for those airplanes. Section 25.807 presently contains two exit requirement tables. The first table specifies the type and number of exits required on each side of the cabin for specific seating capacities up to 179. For airplanes with seating capacities greater than 179, additional exits must be provided as specified in the second table. The number of additional passengers that may be carried for each additional exit of a specific type is generally referred to as the "passenger rating" of that type of exit. Type III exits have a passenger rating of 35; the larger, floor-level Type I and II exits have passenger ratings of 45 and 40, respectively. The first table of § 25.807 specifies that airplanes with 20 to 39 passenger seats must have one Type II and one Type III exit in each side of the airplane. If these same Type II and Type III exits were added to a 179 passenger airplane, the total passenger capacity of that airplane could be increased by 75 passengers to a total of 254. This means that airplanes with seats for 20 to 39 passengers are permitted by § 25.807 to utilize only 27 to 52 percent of the passenger ratings of their Type II and Type III exits. Similarly, the first table of § 25.807 specifies that airplanes with 40 to 79 passenger seats must have one Type I and one Type III exit in each side of the airplane. If these same Type I and Type III exits were added to a 179 passenger airplane, the total passenger capacity of that airplane could be increased by 80 passengers to 259. Airplanes with seats for 40 to 79 passengers are therefore permitted to utilize 50 to 98 percent of the passenger ratings of their Type I and Type III exits.

Although the FAA does not consider that it would be appropriate to exclude airplanes with as many as 108 passengers, it is recognized that compliance with either alternative configuration would place an undue burden on operators of airplanes with smaller passenger capacities. In lieu of 20 or more passengers, as proposed in Notice 91–11, the new standards for access to Type III exits are adopted only for airplanes with seats for 60 or more passengers. Sixty passenger seats is considered an appropriate dividing point because such airplanes typically have at least 15 seat rows that can be adjusted slightly to provide the additional access to the Type III exits without a loss of revenue. It must be noted that all airplanes with Type III exits, including those with fewer than 60 passenger seats, must comply with the requirements for exit placarding, as proposed in the Notice.

Because Part 135 does not apply to operation of airplanes with 60 or more passenger seats, it is no longer necessary to amend Part 135 to require compliance with the proposed requirements for access to Type III exits. Part 135 is amended, however, to specify the requirements for placarding as proposed. Part 135 is also amended to include the provisions of § 121.310 explicitly, as proposed, rather than by reference.

The FAA noted in the preamble to Notice 91–11 that it would also consider alternative means of increasing the flow rate through Type III exits. Some commenters interpreted this to mean that there would literally have to be a 14 percent improvement in the egress rate at each exit. As discussed above, the smaller airplanes generally have a more favorable passenger-exit ratio. The commenters therefore questioned the fairness of requiring smaller airplanes that are already superior in evacuation capability to be improved by the same percentage as the larger airplanes. Since airplanes with fewer than 60 passengers will not be required to comply, the commenters' concerns in this regard are no longer relevant. It does, however, appear that clarification of this point is

needed. The statement that alternative means of increasing the flow rate would be considered was not intended to mean that there would literally have to be an improvement of 14 percent for each Type III exit. The statement was merely a reflection of the provisions for findings of equivalent safety that are already contained in § 21.21(b)(1) of the FAR. That section states, in part, that the applicant is entitled to a type certificate if the product (in this case a transport category airplane) complies with the applicable requirements of the FAR, ". . . or that any airworthiness provisions not complied with are compensated for by factors that provide an equivalent level of safety. . . ." A finding of equivalent safety under the provisions of § 21.21(b)(1) could, of course, be based on a finding that the flow of evacuees through a specific Type III exit was equivalent to that provided by a Configuration C or D seating arrangement. On the other hand, it could be based on the overall evacuation capability of the entire airplane. Findings of equivalent safety have, for example, been granted for airplanes with additional or larger floor level exits in lieu of the Type III exits specified by § 25.807. The burden is, of course, on the applicant to show that there is in fact, an equivalent level of safety.

One commenter believes that placing a seat under or close to a Type III exit can actually enhance evacuation since it affords the passenger an intermediate step up to the lip of the exit. As noted by the commenter, that might enable children and, possibly, some handicapped persons to pass through the exit quicker; but it would delay the passage of most persons through the exit. It would undoubtedly cause a significant delay in the overall evacuation process to the detriment of all occupants.

A number of commenters focus on the applicability of the tests conducted at CAMI in support of Notice 91-11. Several allege that the actual unobstructed width of the passageway tested as Configuration C was actually much less than 20 inches. Some claimed that it was as little as 15 inches. These commenters were apparently misled by an inaccuracy in a figure in the test report depicting the test arrangement. In response to those comments, the FAA attempted to confirm the width of the passageway independently of the report through test photos, recollections of test personnel, etc. The width used in some test runs could not be verified precisely at this late date; however, it was specifically measured by a test observer and found to be 20 inches for at least one of the four runs. Because the tests were conducted over a period of time, there is a possibility that there may have been some minor variation in passageway width. Nevertheless, it has been determined that the passageway did not differ sufficiently from 20 inches in any run to invalidate the test results.

One commenter questions the validity of the testing of Configuration C because the commenter alleges that the competitive behavior tests showed 13 inches to be an effective passageway width. As noted above the researchers concluded that the optimum passageway width is between 13 inches and 25 inches, not 13 inches as stated by the commenter. As also noted above, a specific width of 20 inches was not evaluated during the competitive behavior tests.

A number of commenters note that the CAMI tests considered only interior configurations with three-seat rows on the exit side of the cabin aisle. As discussed above under "Other Tests," a subsequent series of tests did include Configuration G (Figure 1), a configuration similar to Configuration C, except that rows of double seats were used and the unobstructed width of the pathway was only 10 inches. Those tests showed that Configuration G is equivalent to Configuration C in egress capability; therefore, § 25.813(c)(1)(i), as adopted, requires the unobstructed width of the pathway to be at least 10 inches when the adjacent rows on the exit side of the aisle contain no more than two seats.

Commenters also note that the tests did not consider configurations with two adjacent Type III exits on each side of the cabin. As also discussed above under "Other Tests," neither Configuration C nor Configuration D is an available option when the exits are so closely located. Configuration H (Figure 5), a variation of Configuration D, was therefore tested subsequently as a possible alternative. Unlike Configuration G, Configuration H proved to be no better than the minimum access currently required by § 25.813(c). As concluded above under "Other Tests", the only way to achieve the improvement in flow intended by Notice 91-11 would be to locate the exits far enough apart that Configuration C or D could be used. Designing new airplanes with sufficient space between exits does not present insurmountable difficulties as evidenced by existing Boeing 707 and 727 series airplanes and certain Douglas DC-8 series airplanes. Section 25.813(c) is therefore adopted as proposed in this regard.

Moving the exits of existing airplanes to provide sufficient spacing would, on the other hand, be impractical due to cost and other difficulties. In addition, there are other circumstances that would also make compliance with proposed § 121.310(f)(3)(iii) impractical. These include the presence of fixed installations such as lavatories, galleys, etc., or permanently mounted bulkheads if those installations would preclude compliance without a loss in the total number of seats. An insufficient number of seat rows ahead of or behind the exit could also make compliance impractical. Other considerations, such as passenger comfort, have previously ensured sufficient seat row pitch to enable passengers to reach the main aisle quickly in an emergency situation. A severe reduction in seat row pitch could, however, compromise passengers' ability to reach the main aisle quickly in an emergency. Floor loading limitations would also preclude severe reductions in pitch in some airplanes. Compliance would therefore be considered impractical if the seat row pitch would have to be reduced by more than one inch from its present value or to less than 30 inches. As discussed above, the alternative of removing complete seat rows at the exits may prove counterproductive because of the competitive behavior that occurs during evacuation. That alternative would be considered impractical as well.

As noted above, the CAMI competitive behavior tests cast some doubt on the viability of Configuration D. Based on the information presently available, the FAA does not consider compliance practical if Configuration C could not be used for a specific cabin arrangement, and the only possible alternative would be to use Configuration D.

In view of these considerations, § 121.310(f)(3)(iv) is adopted to provide relief when it is determined that such special circumstances exist. The operator must, of course, bear the burden of providing credible reasons as to why compliance is impractical and a description of the steps taken to achieve a level of safety as close to that intended by the new standards as possible. No relief will be granted unless the operator has shown that all practical steps *have* been taken.

A number of commenters observe that the tests did not consider configurations typically found in smaller transport category airplanes, such as seating with only one or two seats on the exit side of the aisle, non-overwing Type III exits that are permitted to be as much as 6 feet above the ground, Type III exits

located at the end of the cabin, etc. As noted above, the FAA did conduct a subsequent test program including a configuration with rows of double seats. The other comments are no longer relevant since, as also noted above, the final rule does not require airplanes with fewer than 60 passenger seats to comply with the access space requirements.

Several commenters attempt to relate the test program to the emergency evacuation demonstrations required in compliance with §§ 25.803 or 121.291. Commenters have also tried to make similar comparisons with real emergency situations. It must be emphasized that these tests were conducted on a comparative basis to evaluate the relative merits of specific design features. Differences from the tests required by § 25.803 or § 121.291, such as cabin lighting, the lack of debris scattered about, age/sex of test subjects, etc. are therefore not relevant. Similarly, differences from real emergency situations are not relevant.

One commenter questions whether the seating of the test subjects was "statistically random." The test subjects were instructed to sit anywhere they wanted. The only constraint placed on them in that regard was that they were instructed to not sit in the same seat a second time. The seating was therefore entirely "random" by accepted mathematical procedures.

Several commenters focus on the results of the first test run for each configuration and allege that the familiarity gained by test subjects in succeeding test runs invalidates the data from those runs. As noted in the preamble to Notice 91-11, the tests were conducted using the principles of Latin Square testing. While it is true that test subjects do gain a degree of familiarity with succeeding test runs, the effects of that familiarity are compensated for by alternating the sequence in which the configurations are tested by different groups. The tests would merely reflect the capabilities of the test subjects if the principles of Latin Square testing were not used or an extremely large number of tests were not conducted. The results of the first test runs alone are therefore not meaningful.

One commenter believes that two few tests were conducted on which to base proposed rulemaking. The FAA concurs that additional testing would improve the accuracy of the test results; however, there is a practical limit to the number of tests that can be conducted considering financial resources, time and the availability of test subjects. In view of the safety benefit that may be realized, the FAA does not consider it prudent to delay the final rule to obtain a larger test data base.

One commenter questions the applicability of the tests because they were conducted with a 17-inch main cabin aisle, while § 25.815 requires, for an airplane with 20 or more passenger seats, the aisle to be at least 15 inches wide from floor level to a point 25 inches above the floor and 20 inches wide above that point. The commenter does correctly quote the requirements of § 25.815; however, the comment is not relevant because there was never a time during any of the tests in which the main aisle wasn't feeding test subjects faster than the exit passageway could accommodate them. One commenter notes that the seats on the opposite side of the main aisle were unoccupied while another further notes that the simulator did not include an exit on the opposite side of the cabin. Others note that the tests did not simulate airplanes with the Type III exits located at the end of the cabin. One commenter believes the test results are not valid because the tests were not conducted with the maximum number of passengers in the cabin simulator. Like the comment concerning aisle width, these observations are not relevant because the main aisle always fed test subjects faster than the exit passageway could accommodate them.

One commenter questions the validity of the tests because they did not consider the height of the space in which the evacuee could stand next to the exit. The FAA does not consider the standing height to be relevant to the test results. Having more height would increase the available workspace and possibly improve egress; having less, on the other hand, would certainly not be a viable reason for decreasing the workspace adjacent to the exit.

The same commenter notes that the testing did not consider passageways leading to the exit through face-to-face seating arrangements. The practical effect of an arrangement of this nature would be that the ratio of passsageway width at upper level to that at floor level would be greater than that of conventional seating arrangements. The FAA is not aware of any airplane currently in service in the U.S. with 60 or more passengers and a configuration of this nature; and, considering that Type III exits are invariably located in the coach-class section where cabin space is used in the most productive manner, it is highly unlikely that an operator would propose such a configuration in the future. In the unlikely event an arrangement of this nature is proposed, the standards proposed in Notice 91-11 are considered equally applicable to arrangements with face-to-face seating.

One commenter notes that tests fail to show any significant differences in the configurations tested with respect to the mean time to prepare the exit for use. The commenter therefore concludes that the configurations proposed in Notice 91-11 would not contribute significantly to that phase of the evacuation. It appears that the commenter's conclusion is inaccurate since exit preparation would certainly be adversely affected by inadequate workspace. In any event, it is not relevant because there will be a significant improvement in the rate of egress after the exit is prepared.

The same commenter also notes that the step-up to and the step-down from the Type III exit in the test facility were 18 inches and 22.5 inches, respectively, while § 25.807(a)(3) permits a step-up of as much as 20 inches and a step-down of as much as 27 inches if the exit is located over a wing. The commenter alleges that the egress rate might have been less sensitive to the passageway leading to the exit if a greater step-down distance had been used. The FAA does not concur. Greater step-up and step-down distances would have made the need for adequate workspace adjacent to the exit even more acute.

One commenter asserts that the weight of the hatch used in the CAMI tests is not representative of those in all aircraft. (Actually, the hatch used was originally installed in a Boeing Model 720.) As noted above, the FAA concurs that hatches should be as light as possible because lighter hatches can generally be removed in less time than those that are heavier. Hatch weight is not relevant to the CAMI test results, however, because it has no bearing on the rate of egress once the hatch is removed.

One commenter believes that the instructions "lift window into cabin" may have influenced the results of the CAMI tests of the various adjacent seating configurations. It appears that the commenter is confusing these tests with the other test series devoted specifically to hatch placement since no instructions of this nature were given during the former tests.

Another commenter believes that the test results should consider only the time required for the first 15 or 30 test subjects to egress rather than the full number that participated. The FAA does not concur. Limiting the number of test subjects would tend to skew the test results in favor of the configurations in which the fastest test subjects were seated closest to the exit. It appears that

the commenter is attempting to relate the tests to the 90-second evacuation demonstration time required by § 25.803. As noted above, the tests conducted by CAMI were to evaluate specific design features on a comparative basis and are not relevant to the demonstration required by § 25.803.

One commenter, an association representing U.S. aircraft manufacturers, believes that there is insufficient evidence to indicate that the increase in space required by the proposed regulation would produce the desired improvement in safety. The commenter prepared a detailed assessment of costs and benefits that is included in the docket for this rulemaking. For the most part, the assessment is no longer relevant due to the changes discussed above. To the extent they are still applicable, these and all other comments of an economic nature have been considered in the development of the regulatory evaluation of this final rule.

The same commenter further states that the proposed six-month implementation period is based on unrealistic and inaccurate assumptions about current seat pitches and the capability of the airlines to reconfigure current aircraft. Other commenters present similar views. According to the commenters, six months would not allow sufficient time for the required engineering, manufacturing, procurement, installation, and certification. The FAA recognizes that many factors must be considered in designing and implementing the required changes and that there may be unusual circumstances in which fleet-wide compliance cannot reasonably be achieved within six months. Although the FAA does not concur that a compliance period longer than six months is needed in general, § 121.310(f)(3)(v) has been adopted to provide relief when such unusual circumstances do exist. When supported by credible reasons showing that compliance cannot be achieved by the specified date, such relief will be granted in the form of a deviation allowing fleet compliance in incremental stages.

As discussed in the preamble to Notice 91–11, the FAA recognizes that many factors must be evaluated in designing transport category airplanes for safe evacuations. Cabin rulemaking must consider the interaction among cabin sizes, passenger capacity, the type and number of emergency exits, exit location, distance between exits, aisle design, exit row and escape path markings and lighting, flame resistance of cabin interior materials, and other important variables. In order to develop future proposed safety standards by using a systems-type analysis, the FAA chartered a committee of safety experts, known as the Aviation Rulemaking Advisory Committee (ARAC), on February 5, 1991. Under the auspices of the ARAC are several subcommittees which will deal with different areas of FAA rulemaking activity. One of the subcommittees is the Emergency Evacuation Subcommittee. The Emergency Evacuation Subcommittee, in turn, has established a Performance Standards Working Group, which reports to the subcommittee.

Members of the working group represent the interests of airplane manufacturers; airlines; an airplane equipment manufacturer; pilot, flight attendant, and machinists unions; an airline passenger association; the National Transportation Safety Board; and the airworthiness authorities of Europe, Canada, and the United States. The working group's charter is to recommend whether new or revised standards for emergency evacuation can and should be adopted as performance-based standards. Performance-based standards state regulatory requirements in terms of objective safety performance rather than specific design requirements. To date the working group has met six times (on a bi-monthly basis), but has not yet made any recommendations to the subcommittee for any new performance based standards or for any performance based standards to replace existing non-performance based design standards.

Performance-based standards are desirable from the standpoint that they offer the manufacturer maximum flexibility in designing equipment or systems to comply with the regulations. They can, however, be difficult to develop, particularly when involved with human performance, as is the case with emergency evacuation regulations. Therefore, in view of the potential increase in safety that can be realized by early adoption of this rule, the FAA does not consider that deferring action concerning access to Type III exits pending further study by ARAC, as expressed by some commenters, is warranted. Nevertheless, it may be anticipated that other new cabin safety standards will be developed by ARAC and proposed by the FAA in future rulemaking.

Except as noted above, parts 25, 121 and 135 are amended as proposed in Notice 91–11.

Regulatory Evaluation

This section summarizes the full regulatory evaluation prepared by the FAA that provides detailed estimates of the economic consequences of this regulatory action. This summary and the full evaluation quantify, to the extent practicable, estimates of the costs and benefits to the private sector, consumers, and Federal, State, and local governments.

Executive Order 12291, dated February 17, 1981, directs Federal agencies to promulgate new regulations or to modify existing regulations only if potential benefits to society outweigh potential costs for each regulatory change. The order also requires the preparation of a Regulatory Impact Analysis of all "major" rules, except those responding to emergency situations or other narrowly-defined exigencies. A "major" rule is one that is likely to have an annual impact on the economy of $100 million or more a major increase in consumer costs, or a significant adverse effect on competition.

The FAA has determined that this rule is not major as defined in the Executive Order. Therefore, a full regulatory analysis that includes the identification and evaluation of cost-reducing alternatives to the rule has not been prepared. Instead, the Agency has prepared a more concise regulatory evaluation that analyzes only this rule without identifying alternatives. In addition to a summary of the regulatory evaluation, this section also contains a regulatory flexibility determination required by the 1980 Regulatory Flexibility Act (P.L. 96–354) and an international trade impact assessment. The complete regulatory evaluation, which contains more detailed economic information than this summary provides, is available in the docket.

Cost-Benefit Analysis

The primary objective of this rule is to enhance aviation safety. An examination of the cost and the benefits associated with the amendments to Parts 25, 121, and 135—Improved Access to Type III Exits—are presented below.

Costs

The rule will require operators of transport category airplanes with 60 or more passenger seats to improve the access to Type III exits. In addition, the rule will require placards to be displayed in all airplanes with Type III exits that descibe how to open the exit, how much it weighs, and where to stow it. The costs of the rule can be separated into those incurred under part 25, those

incurred under part 121, and those incurred under part 135.

The FAA has determined that manufacturers can design the interior arrangements of airplanes that will receive future type certifications so that there will be no less of seats as a result of these improved access requirements. Therefore, there are no costs attributable to improved access requirements under part 25. A placard that meets the requirements of the rule will cost approximately $180 to design and $100 per airplane to install. The FAA estimates that the cost of placards for new airplane types with Type III exits will be approximately $66,000 over the years 1993–2002, or $40,800 discounted.

The current fleet of airplanes with passenger seating capacities of 60 seats or more and Type III exits will have to meet the requirements for improved access under part 121. The FAA has determined that 2,579 airplanes will be affected. Because of the flexibility in the rule, the FAA has determined that all of these airplanes will meet the requirements of the rule through reconfiguration, rather than seat removal. The costs of reconfiguration, including design changes, approval, and labor and materials to effect the reconfiguration, will be $3.5 million, or $3.2 million discounted. Currently certificated airplanes with Type III exits and passenger configurations of 60 or more that have not yet been manufactured will also be required to meet the exit access requirements of Part 121. However, since configuration is included in the costs of production of these new airplanes, there are no additional costs incurred as a result of the exit access requirements.

Placards will also be rquired for currently-certificated airplanes with Type III exits with passenger seating configurations of 20 or more. The total cost to the current affected fleet of 3,004 airplanes will be $329,000, or $299,000 discounted. Over the years 1993–2002, the FAA estimates that 3,308 currently-certificated airplanes operating under Part 121 and equipped with Type III exits will be manufactured. The costs of placards for these airplanes will be $331,000, or $218,000 discounted.

Very few airplanes with 20 or more seats and Type III exits operate under Part 135. The FAA has determined that there are currently 41 such airplanes with a maximum of 7 different seating configurations. Further, the FAA estimates that 45 new affected airplanes will be manufactured during the period 1993–2002. The costs of design, approval, production, and installation of placards for these existing and new airplanes will total $5,600, or $4,500 discounted.

The total costs of compliance of the rule over the years 1993–2002 will be $4.3 million, or $3.8 million discounted to present value. More than 80 percent of this cost will be incurred to comply with the requirements for improved access. Once the current fleet is reconfigured, the only cost of compliance of the rule will be that for placards, no more than $280 per airplane.

Benefits

The rule is expected to reduce the time to evacuate an airplane's Type III exit in the event of an emergency. During the years 1982 to 1991, there have been three domestic accidents involving airplanes with Type III exits where passengers used those exits and where fire and/or smoke inhalation produced post-accident fatalities. Another accident occurred to a foreign-registered airplane with Type III exits operating in the United States. Seventy-two passengers and seven crewmembers died in these accidents.

In the most recent accident, which occurred February 1, 1991, 37 passengers escaped through a Type III exit on a Boeing 737. However, a deceased flight attendant and 10 deceased passengers were found lined up in the aisle within 8 feet of the exit. They died as a result of smoke and particulate inhalation. The NTSB reported that "they most likely collapsed while waiting to climb out the overwing exit." The tests conducted by CAMI showed that the access requirements in the rule could result in a 14 percent improvement in the flow rate. This improvement would have resulted in 5 additional passengers and/or crewmembers being able to evacuate the 737. Applying a statistical economic value of a life of $1.5 million to the estimated 5 lives that could have been saved with improved access to the Type III exit in this accident results in a value of $7.5 million in 1992 dollars. Assuming that one life is saved every two years over the period from 1993–2002, the value of $7.5 million, discounted to present value, is $4.4 million.

Comparison of Costs and Benefits

The costs of the rule will be $4.3 million over the years 1993–2002, or $3.8 million discounted to present value. Over the same period of time, the FAA estimates that approximately 5 lives can be saved due to improved access to Type III exits and the requirements for instructive placards at those exits, resulting in benefits of $7.5 million, or $4.4 million discounted. Thus, the FAA has determined that the proposed rule is cost-beneficial.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) requires Federal agencies to review rules that may have a "significant economic impact on a substantial number of small entities." The FAA has adopted criteria and guidelines for rulemaking officials to apply when determining whether a proposed or existing rule has any significant economic impact on a substantial number of small entities.

The entities that would be affected by this rule are the owners of airplanes with Type III exits. These owners include air carriers, banks, leasing companies, and manufacturers of such airplanes. Based on the Regulatory Flexibility Criteria and Guidance, the size threshold for operators of airplanes for hire is nine airplanes owned, while the cost threshold varies from about $4,300 to $110,100 in 1991 dollars, depending on type of service and/or fleet seating capacity. A substantial number is one that is not less than 11 or which is more than one-third of affected small entities.

The FAA has determined that the rule will not have a significant economic impact on a substantial number of small entities. Approximately 47 affected owners can be considered small entities. The costs of the rule to the carriers will not exceed the threshold limits given above. In addition, the number of small leasing companies that own affected airplanes is less than the 11 necessary for a substantial number of small entities affected by the rule. Therefore, the FAA has determined that the rule will not have a significant economic impact on a substantial number of small entities.

International Trade Impact Assessment

The rule will have little impact on international trade. U.S. and foreign airplane manufacturers can easily configure airplanes cabins to suit customers, either foreign or domestic. Because the rule will not require the removal of seats, U.S. carriers will not be at a competitive disadvantage. Once the existing affected fleet is reconfigured, the only costs to new airplanes (either currently type-certificated or new types) will be those for placards at the exits.

Federalism Implications

The regulations adopted herein will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance

with Executive Order 12612, it is determined that this final rule will not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

For the reasons given earlier in the preamble, the FAA has determined that this is not a major rule as defined in Executive Order 12291. Because this final rule concerns a matter on which there is significant public interest, the FAA has determined that this action is significant as defined in Department of Transportation Regulatory Policies and Procedures (44 FR 11034, February 26, 1979). The FAA has carefully considered the impact of the rule on small entities and has concluded that there will not be a significant impact, positive or negative, on a substantial number of small entities. A final regulatory evaluation of the rule, including a Regulatory Flexibility Determination and International Trade Impact Analysis, has been placed in the docket. A copy may be obtained by contacting the person identified under "**FOR FURTHER INFORMATION CONTACT.**"

List of Subjects

14 CFR Part 25

Air transportation, Aircraft, Aviation safety, Safety.

14 CFR Part 121

Air carriers, Air transportation, Aircraft, Airplanes, Aviation safety, Common carriers, Crashworthiness, Emergency evacuation, Transportation, Safety.

14 CFR Part 135

Air carriers, Air transportation, Aircraft, Airplanes, Aviation safety, Transportation, Safety.

Adoption of the Amendment

Accordingly, the Federal Aviation Administration amends 14 CFR parts 25, 121, and 135 of the Federal Aviation Regulations (FAR) as follows:

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

1. The authority citation for Part 25 continues to read as follows:

Authority: 49 U.S.C. 1344, 1354(a), 1355, 1421, 1423, 1424, 1425, 1428, 1429, 1430, 49 U.S.C. 106(g); and 49 CFR 1.47(a).

2. By amending § 25.813 by revising paragraphs (a) and (c) to read as follows:

§ 25.813 Emergency exit access.

* * * * *

(a) There must be a passageway leading from the nearest main aisle to each Type I, Type II, or Type A emergency exit and between individual passenger areas. Each passageway leading to a Type A exit must be unobstructed and at least 36 inches wide. Passageways between individual passenger areas and those leading to Type I and Type II emergency exits must be unobstructed and at least 20 inches wide. Unless there are two or more main aisles, each Type A exit must be located so that there is passenger flow along the main aisle to that exit from both the forward and aft directions. If two more more main aisles are provided, there must be unobstructed cross-aisles at least 20 inches wide between main aisles. There must be—

(1) A cross-aisle which leads directly to each passageway between the nearest main aisle and a Type A exit; and

(2) A cross-aisle which leads to the immediate vicinity of each passageway between the nearest main aisle and a Type 1, Type II, or Type III exit; except that when two Type III exits are located within three passenger rows of each other, a single cross-aisle may be used if it leads to the vicinity between the passageways from the nearest main aisle to each exit.

* * * * *

(c) The following must be provided for each Type III or Type IV exit—(1) There must be access from the nearest to each exit. In addition, for each Type III exit in an airplane that has a passenger seating configuration of 60 or more—

(i) Except as provided in paragraph (c)(1)(ii), the access must be provided by an unobstructed passageway that is at least 10 inches in width for interior arrangements in which the adjacent seat rows on the exit side of the aisle contain no more than two seats, or 20 inches in width for interior arrangements in which those rows contain three seats. The width of the passageway must be measured with adjacent seats adjusted to their most adverse position. The centerline of the required passageway width must not be displaced more than 5 inches horizontally from that of the exit.

(ii) In lieu of one 10- or 20-inch passageway, there may be two passageways, between seat rows only, that must be at least 6 inches in width and lead to an unobstructed space adjacent to each exit. (Adjacent exits must not share a common passageway.) The width of the passageways must be measured with adjacent seats adjusted to their most adverse position. The unobstructed space adjacent to the exit must extend vertically from the floor to the ceiling (or bottom of sidewall stowage bins), inboard from the exit for a distance not less than the width of the narrowest passenger seat installed on the airplane, and from the forward edge of the forward passageway to the aft edge of the aft passageway. The exit opening must be totally within the fore and aft bounds of the unobstructed space.

(2) In addition to the access—

(i) For airplanes that have a passenger seating configuration of 20 or more, the projected opening of the exit provided must be obstructed and there must be no interference in opening the exit by seats, berths, or other protrusions (including any seatback in the most adverse position) for a distance from that exit not less than the width of the narrowest passenger seat installed on the airplane.

(ii) For airplanes that have a passenger seating configuration of 19 or fewer, there may be minor obstructions in this region, if there are compensating factors to maintain the effectiveness of the exit.

(3) For each Type III exit, regardless of the passenger capacity of the airplane in which it is installed, there must be placards that—

(i) Are readable by all persons seated adjacent to and facing a passageway to the exit;

(ii) Accurately state or illustrate the proper method of opening the exit, including the use of handholds; and

(iii) If the exit is a removable hatch, state the weight of the hatch and indicate an appropriate location to place the hatch after removal.

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PART 121—CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT

3. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. 1354(a), 1355, 1356, 1357, 1401, 1421 through 1430, 1472, 1485, and 1502; 49 U.S.C. 106(g); and 49 CFR 1.47(a).

4. By amending § 121.310 by revising paragraph (f)(3)(ii) and adding paragraphs (f)(3)(iii), (iv), and (v) to read as follows:

§ 121.310 Additional emergency equipment.

* * * * *

(f) * * *

(3) * * *

(i) * * *

(ii) For an airplane for which the application for the type certificate was filed on or after May 1, 1972, the access

must meet the emergency exit access requirements under which the airplane was type certified; except that,

(iii) After December 3, 1992, the access for an airplane type certificated after January 1, 1958, must meet the requirements of § 25.813(c) of this chapter, effective June 3, 1992.

(iv) Contrary provisions of this section notwithstanding, the Manager of the Transport Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, may authorize deviation from the requirements of paragraph (f)(3)(iii) of this section if it is determined that special circumstances make copmliance impractical. Such special circumstances include, but are not limited to, the following conditions when they preclude achieving compliance with § 25.813(c)(1)(i) or (ii) without a reduction in the total number of passenger seats: emergency exits located in close proximity to each other; fixed installations such as lavatories, galleys, etc.; permanently mounted bulkheads; an insufficient number of rows ahead of or behind the exit to enable compliance without a reduction in the seat row pitch of more than one inch; or an insufficient number of such rows to enable compliance without a reduction in the seat row pitch to less than 30 inches. A request for such grant of deviation must include credible reasons as to why literal compliance with § 25.813(c)(1)(i) or (ii) is impractical and a description of the steps taken to achieve a level of safety as close to that intended by § 25.813(c)(1)(i) or (ii) as is practical.

(v) The Manager of the Transport Airplane Directorate, Aircraft Certification Service, Federal Aviation Administration, may also authorize a compliance date later than December 3, 1992, if it is determined that special circumstances make compliance by that date impractical. A request for such grant of deviation must outline the airplanes for which compliance will be achieved by December 3, 1992, and include a proposed schedule for incremental compliance of the remaining airplanes in the operator's fleet. In addition, the request must include credible reasons why compliance cannot be achieved earlier.

PART 135—AIR TAXI OPERATORS AND COMMERCIAL OPERATORS

5. The authority citation for part 135 continues to read as follows:

Authority: 49 U.S.C. 1354(a), 1355, 1356, 1357, 1401, 1421–1431, and 1502; 49 U.S.C. 160(g); and 49 CFR 1.47(a).

§ 135.177 [Amended]

6. By amending § 135.177 by removing and reserving paragraph (a)(4).

7. By adding a new § 135.178 to read as follows:

§ 135.178 Additional emergency equipment.

No person may operate an airplane having a passenger seating configuration of more than 19 seats, unless it has the additional emergency equipment specified in paragraphs (a) through (l) of this section.

(a) *Means for emergency evacuation.* Each passenger-carrying landplane emergency exit (other than over-the-wing) that is more than 6 feet from the ground, with the airplane on the ground and the landing gear extended, must have an approved means to assist the occupants in descending to the ground. The assisting means for a floor-level emergency exit must meet the requirements of § 25.809(f)(1) of this chapter in effect on April 30, 1972, except that, for any airplane for which the application for the type certificate was filed after that date, it must meet the requirements under which the airplane was type certificated. An assisting means that deploys automatically must be armed during taxiing, takeoffs, and landings; however, the Administrator may grant a deviation from the requirement of automatic deployment if he finds that the design of the exit makes compliance impractical, if the assisting means automatically erects upon deployment and, with respect to required emergency exits, if an emergency evacuation demonstration is conducted in accordance with § 121.291(a) of this chapter. This paragraph does not apply to the rear window emergency exit of Douglas DC-3 airplanes operated with fewer than 36 occupants, including crewmembers, and fewer than five exits authorized for passenger use.

(b) *Interior emergency exit marking.* The following must be complied with for each passenger-carrying airplane:

(1) Each passenger emergency exit, its means of access, and its means of opening must be conspicuously marked. The identity and location of each passenger emergency exit must be recognizable from a distance equal to the width of the cabin. The location of each passenger emergency exit must be indicated by a sign visible to occupants approaching along the main passenger aisle. There must be a location sign—

(i) Above the aisle near each over-the-wing passenger emergency exit, or at another ceiling location if it is more practical because of low headroom;

(ii) Next to each floor level passenger emergency exit, except that one sign may serve two such exits if they both can be seen readily from that sign; and

(iii) On each bulkhead or divider that prevents fore and aft vision along the passenger cabin, to indicate emergency exits beyond and obscured by it, except that if this is not possible, the sign may be placed at another appropriate location.

(2) Each passenger emergency exit marking and each locating sign must meet the following:

(i) For an airplane for which the application for the type certificate was filed prior to May 1, 1972, each passenger emergency exit marking and each locating sign must be manufactured to meet the requirements of § 25.812(b) of this chapter in effect on April 30, 1972. On these airplanes, no sign may continue to be used if its luminescence (brightness) decreases to below 100 microlamberts. The colors may be reversed if it increases the emergency illumination of the passenger compartment. However, the Administrator may authorize deviation from the 2-inch background requirements if he finds that special circumstances exist that make compliance impractical and that the proposed deviation provides an equivalent level of safety.

(ii) For an airplane for which the application for the type certificate was filed on or after May 1, 1972, each passenger emergency exit marking and each locating sign must be manufactured to meet the interior emergency exit marking requirements under which the airplane was type certificated. On these airplanes, no sign may continue to be used if its luminescence (brightness) decreases to below 250 microlamberts.

(c) *Lighting for interior emergency exit markings.* Each passenger-carrying airplane must have an emergency lighting system, independent of the main lighting system; however, sources of general cabin illumination may be common to both the emergency and the main lighting systems if the power supply to the emergency lighting system is independent of the power supply to the main lighting system. The emergency lighting system must—

(1) Illuminate each passenger exit marking and location sign;

(2) Provide enough general lighting in the passenger cabin so that the average illumination when measured at 40-inch intervals at seat armrest height, on the centerline of the main passenger aisle, is at least 0.05 foot-candles; and

(3) For airplanes type certificated after January 1, 1958, include floor proximity

emergency escape path marking which meets the requirements of § 25.812(e) of this chapter in effect on November 26, 1984.

(d) *Emergency light operation.* Except for lights forming part of emergency lighting subsystems provided in compliance with § 25.812(h) of this chapter (as prescribed in paragraph (h) of this section) that serve no more than one assist means, are independent of the airplane's main emergency lighting systems, and are automatically activated when the assist means is deployed, each light required by paragraphs (c) and (h) of this section must:

(1) Be operable manually both from the flightcrew station and from a point in the passenger compartment that is readily accessible to a normal flight attendant seat;

(2) Have a means to prevent inadvertent operation of the manual controls;

(3) When armed or turned on at either station, remain lighted or become lighted upon interruption of the airplane's normal electric power;

(4) Be armed or turned on during taxiing, takeoff, and landing. In showing compliance with this paragraph, a transverse vertical separation of the fuselage need not be considered;

(5) Provide the required level of illumination for at least 10 minutes at the critical ambient conditions after emergency landing; and

(6) Have a cockpit control device that has an "on," "off," and "armed" position.

(e) *Emergency exit operating handles.* (1) For a passenger-carrying airplane for which the application for the type certificate was filed prior to May 1, 1972, the location of each passenger emergency exit operating handle, and instructions for opening the exit, must be shown by a marking on or near the exit that is readable from a distance of 30 inches. In addition, for each Type I and Type II emergency exit with a locking mechanism released by rotary motion of the handle, the instructions for opening must be shown by—

(i) A red arrow with a shaft at least three-fourths inch wide and a head twice the width of the shaft, extending along at least 70° of arc at a radius approximately equal to three-fourths of the handle length; and

(ii) The word "open" in red letters 1 inch high placed horizontally near the head of the arrow.

(2) For a passenger-carrying airplane for which the application for the type certificate was filed on or after May 1, 1972, the location of each passenger emergency exit operating handle and instructions for opening the exit must be shown in accordance with the requirements under which the airplane was type certificated. On these airplanes, no operating handle or operating handle cover may continue to be used if its luminescence (brightness) decreases to below 100 microlamberts.

(f) *Emergency exit access.* Access to emergency exits must be provided as follows for each passenger-carrying airplane:

(1) Each passageway between individual passenger areas, or leading to a Type I or Type II emergency exit, must be unobstructed and at least 20 inches wide.

(2) There must be enough space next to each Type I or Type II emergency exit to allow a crewmember to assist in the evacuation of passengers without reducing the unobstructed width of the passageway below that required in paragraph (f)(1) of this section; however, the Administrator may authorize deviation from this requirement for an airplane certificated under the provisions of part 4b of the Civil Air Regulations in effect before December 20, 1951, if he finds that special circumstances exist that provide an equivalent level of safety.

(3) There must be access from the main aisle to each Type III and Type IV exit. The access from the aisle to these exits must not be obstructed by seats, berths, or other protrusions in a manner that would reduce the effectiveness of the exit. In addition, for a transport category airplane type certificated after January 1, 1958, there must be placards installed in accordance with § 25.813(c)(3) for each Type III exit.

(4) If it is necessary to pass through a passageway between passenger compartments to reach any required emergency exit from any seat in the passenger cabin, the passageway must not be obstructed. Curtains may, however, be used if they allow free entry through the passageway.

(5) No door may be installed in any partition between passenger compartments.

(6) If it is necessary to pass through a doorway separating the passenger cabin from other areas to reach a required emergency exit from any passenger seat, the door must have a means to latch it in the open position, and the door must be latched open during each takeoff and landing. The latching means must be able to withstand the loads imposed upon it when the door is subjected to the ultimate inertia forces, relative to the surrounding structure, listed in § 25.561(b) of this chapter.

(g) *Exterior exit markings.* Each passenger emergency exit and the means of opening that exit from the outside must be marked on the outside of the airplane. There must be a 2-inch colored band outlining each passenger emergency exit on the side of the fuselage. Each outside marking, including the band, must be readily distinguishable from the surrounding fuselage area by contrast in color. The markings must comply with the following:

(1) If the reflectance of the darker color is 15 percent or less, the reflectance of the lighter color must be at least 45 percent.

(2) If the reflectance of the darker color is greater than 15 percent, at least a 30 percent difference between its reflectance and the reflectance of the lighter color must be provided.

(3) Exits that are not in the side of the fuselage must have the external means of opening and applicable instructions marked conspicuously in red or, if red is inconspicuous against the background color, in bright chrome yellow and, when the opening means for such an exit is located on only one side of the fuselage, a conspicuous marking to that effect must be provided on the other side. "Reflectance" is the ratio of the luminous flux reflected by a body to the luminous flux it receives.

(h) *Exterior emergency lighting and escape route.* (1) Each passenger-carrying airplane must be equipped with exterior lighting that meets the following requirements:

(i) For an airplane for which the application for the type certificate was filed prior to May 1, 1972, the requirements of § 25.812 (f) and (g) of this chapter in effect on April 30, 1972.

(ii) For an airplane for which the application for the type certificate was filed on or after May 1, 1972, the exterior emergency lighting requirements under which the airplane was type certificated.

(2) Each passenger-carrying airplane must be equipped with a slip-resistant escape route that meets the following requirements:

(i) For an airplane for which the application for the type certificate was filed prior to May 1, 1972, the requirements of § 25.803(e) of this chapter in effect on April 30, 1972.

(ii) For an airplane for which the application for the type certificate was filed on or after May 1, 1972, the slip-resistant escape route requirements under which the airplane was type certificated.

(i) *Floor level exits.* Each floor level door or exit in the side of the fuselage (other than those leading into a cargo or baggage compartment that is not accessible from the passenger cabin)

that is 44 or more inches high and 20 or more inches wide, but not wider than 46 inches, each passenger ventral exit (except the ventral exits on Martin 404 and Convair 240 airplanes), and each tail cone exit, must meet the requirements of this section for floor level emergency exits. However, the Administrator may grant a deviation from this paragraph if he finds that circumstances make full compliance impractical and that an acceptable level of safety has been achieved.

(j) *Additional emergency exits.* Approved emergency exits in the passenger compartments that are in excess of the minimum number of required emergency exits must meet all of the applicable provisions of this section, except paragraphs (f) (1), (2), and (3) of this section, and must be readily accessible.

(k) On each large passenger-carrying turbojet-powered airplane, each ventral exit and tailcone exit must be—

(1) Designed and constructed so that it cannot be opened during flight; and

(2) Marked with a placard readable from a distance of 30 inches and installed at a conspicuous location near the means of opening the exit, stating that the exit has been designed and constructed so that it cannot be opened during flight.

(l) *Portable lights.* No person may operate a passenger-carrying airplane unless it is equipped with flashlight stowage provisions accessible from each flight attendant seat.

Issued in Washington, DC, on April 28, 1992.

Barry Lambert Harris,

Acting Administrator.

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