DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. 26140; Amendment No. 25–88]

RIN 2120–AC43

Type and Number of Passenger Emergency Exits Required in Transport Category Airplanes

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This amendment defines two new types of passenger emergency exits in transport category airplanes, provides more consistent standards with respect to the passenger seating allowed for each exit type and combination of exit types, and requires escape slides to be erected in less time. These changes allow more flexibility in the design of emergency exits and reflect recent improvements in escape slide technology. They will enable more cost-effective emergency exit arrangements and, in the case of escape slides, enable more rapid egress of passengers under emergency conditions.

EFFECTIVE DATE: December 9, 1996.

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SUPPLEMENTARY INFORMATION:

Background

This amendment is based on Notice of Proposed Rulemaking (NPRM) No. 90–4 which was published in the Federal Register on February 22, 1990 (55 FR 6344). In that notice, the FAA proposed amendments to 14 CFR part 25 that would revise the current requirements for the passenger emergency exits of transport category airplanes and define two new exit types. In addition, the FAA also proposed to require escape slides to be erected in less time, a reflection of improvements in escape slide state-of-the-art.

Since the time Notice No. 90–4 was published, a number of amendments were adopted. The changes adopted with Amendment 25–72 (55 FR 29781, July 20, 1990) are largely nonsubstantive in nature; however, the editorial structure of the sections involved in the proposals of Notice No. 90–4 was changed considerably. The changes adopted with Amendment 25–76 (57 FR 19220, May 4, 1992) do not have any substantive bearing on those proposed in Notice 90–4; however, they also affect the editorial structure of those sections. Where pertinent, the effect of those amendments on the changes proposed in Notice 90–4 is discussed below. None of the other amendments adopted during this period have any bearing on the proposals of Notice No. 90–4.

Current Requirements of Part 25

Part 25 currently defines seven types of passenger emergency exits for transport category airplanes—Type A, Types I through IV, tail cone and ventral. As defined in § 25.807, exits in fuselage sides range in size from large Type A exits, which must be a minimum of 42 inches wide by 72 inches high, to Type IV exits, which must be a minimum of 19 inches wide by 26 inches high. Although an exit may exceed the minimum dimensions specified for a particular type, it is considered to be of that type unless it qualifies in all respects as one of the larger exit types. Typically, the larger exits are hinged or translating doors while the smaller exits are typically removable hatches.

Section 25.809(b)(2) requires that each emergency exit must be capable of being opened, when there is no fuselage deformation, within 10 seconds measured from the time when the opening means is actuated to the time when the exit if fully opened.

It must be emphasized that, except for tail-cone or ventral exits, all references to the types and numbers of required passenger emergency exits in part 25 and this final rule refer to the exits required in each side of the fuselage, not the total for the airplane. Although they are not required to be symmetrical, corresponding exits on opposite sides of the fuselage are usually referred to as ''exit pairs'' to preclude confusion between the total number of exits and the number of exits on each side. The number of additional passenger seats that may be installed for each additional exit pair of a specific type is sometimes referred to as the ''exit rating'' for that type. When an ''exit pair'' consists of two different types of exits, the exits are both considered to be of the type with the smaller exit rating. Generally, no credit is given for an exit on one side with no corresponding exit on the other side. (Even though no credit is given to such exits, they are required to meet all applicable exit design requirements because they may be used by occupants under emergency conditions.)

Note that the standards of part 25, including those for emergency evacuation demonstrations as well as those concerning types and numbers of exits, are based on the assumption that only half of the exits will be usable during an actual emergency due to fire, structural damage or other adverse circumstance.

Section 25.807(d) currently specifies the type and number of emergency exits required for three ranges of passenger seating capacities. The first range, passenger seating configurations of one to 179, is addressed in § 25.807(d)(1) in a table that outlines the specific type and number of exits that must be provided. Those standards have been in effect for several decades and were based more on industry practice during the reciprocating-engine transport airplane era than on any particular testing.

For the second range, passenger seating configurations of 180 to 299, § 25.807(d)(1) uses a different approach. Instead of specifying the type and number of exits required for those airplanes, a second table supplements the first by specifying the number of passenger seats, in addition to 179, that may be installed for various types of additional exits. For example, the first table specifies that an airplane with 179 passenger seats must have two pairs of Type I exits and two pairs of Type III exits. The second table specifies that the seating may be increased by 45 passengers for each additional pair of Type I exits installed. An airplane with three pairs of Type I exits and two pairs of Type III exits would, therefore, be permitted, insofar as the type and number of exits is concerned, to have a passenger seating configuration of 224.

For the third range, passenger seating configurations greater than 299, § 25.807(d)(2) simply states that each exit installed in the side of the fuselage must be either a Type I or Type A exit and that seating configurations of 45 and 110 are allowed for each pair of Type I exits and each pair of Type A exits, respectively.

Section 25.807(d)(3) specifies the number of additional passenger seats that may be provided when creditable ventral or tail-cone exits are installed. In order to receive any credit as a passenger emergency exit, a ventral or tail-cone exit must provide the same rate of egress as a Type III exit with the airplane in the most adverse exit opening condition that would result from the collapse of one or more landing gear legs.

As amended recently by Amendment 25–72, § 25.807(d)(5) provides flexibility in the type and number of exits required by stating that an alternate emergency exit configuration may be approved in lieu of that specified in either § 25.807(d) (1) or (2) provided the

overall evacuation capability is shown to be equal to or greater than that of the specified emergency exit configuration. This means, for example, that one pair of larger exits could be substituted in some cases for two pairs of smaller exits.

Providing the type and number of exits specified for a given number of passenger seats does not, in itself, ensure that an airplane can be approved with that many seats. Other requirements, such as uniform distribution of passenger seats and exits and the demonstrated emergency evacuation capability, may actually limit seating to fewer passengers.

Part 25 specifies that a means must be provided to assist passengers in descending to the ground for each exit, other than an overwing exit, that is more than six feet from the ground when the airplane is on the ground with the landing gear extended. Section 25.810(a)(1)(i) specifies that the assist means must be deployed automatically and that deployment must begin during the interval between the time the exit opening means is actuated from inside the airplane and the time the exit is fully opened. As noted above, that time interval must be no more than 10 seconds. Section 25.810(a)(1)(ii) further specifies that the assist means must be automatically erected within 10 seconds after deployment is begun. Taking the maximum time intervals permitted, the assist means must be erected and usable no more than 20 seconds after the exit opening means is actuated. Generally, inflatable slides are used for this purpose.

For an overwing exit, § 25.810(d) specifies that a means must be provided to assist passengers in descending to the ground whenever the place on the airplane structure at which the escape route terminates (typically the trailing edge of a wing flap) is more than six feet from the ground. Inflatable slides are generally used for this purpose also. Part 25 currently contains no specific maximum erection time for off-wing slides; however, Technical Standard Order (TSO) C69b, which contains design standards for inflatable escape slides, specifies that off-wing escape slides must be fully erect within 10 seconds after actuation of the inflation controls. (TSO–C69a, which was superseded by TSO–C69b on August 17, 1988, had previously a maximum erection time of 15 seconds.)

Because the large Type A emergency exits are expected to accommodate parallel lines of evacuees simultaneously, § 25.810(a)(1) specifies that the means provided for those exits to assist the occupants in descending to the ground must also be capable of carrying two parallel lines of evacuees simultaneously.

Section 25.813(b) requires adequate space next to one side of each emergency exit, other than a Type A exit, that is required by § 25.810(a) to have an assist means to allow crewmembers to assist in the evacuation. Because there are two parallel lines of evacuees to assist, each Type A emergency exit is required to have an assist space on each side of the exit. Unlike other exit types, Type A exits must have such assist space regardless of whether the exit is required to have an assist means. At the time Notice 90–4 was issued, the latter requirement was contained in § 25.807(a)(7)(vii); however, it has since been consolidated with the former in § 25.813(b) (Amendment 25–72).

Amendments Proposed in Notice 90–4

The FAA held a public technical conference in Seattle, Washington, in September 1985, to review the existing safety regulations and practices regarding the emergency evacuation of transport airplanes. As a result of the conference, it was recommended, in part, that the regulations relative to passenger emergency exits be revised to provide design flexibility, and those concerning escape slide inflation time be revised to reflect the current state-of-the-art. Subsequent to this public conference, the following changes were proposed in Notice 90–4:

Type and Number of Emergency Exits

Unlike the standards for airplanes with more than 299 seats, the number of additional passenger seats allowed for smaller passenger capacities is not uniform. For example, the first table of § 25.807(d)(1) (§ 25.807(c) prior to Amendment 25–72) requires a pair of Type I exits and a pair of Type III exits for a maximum passenger seating capacity of 79. Adding another pair of Type I exits, resulting in a total of two pairs of Type I exits and one pair of Type III exits, would allow up to 139 passenger seats—an increase of 60 attributable to the additional pair of Type I exits. In contrast, one pair of Type I exits and two pairs of Type III exits are required for a maximum seating configuration of 109. Adding another pair of Type I exits in that case, resulting in a total of two pairs of Type I exits and two pairs of Type III exits, would allow up to 179 passengers—an increase of 70 attributable to the additional pair of Type I exits. For configurations beyond 179 passengers, the second table of § 25.807(d)(1) allows an increase of only 45 for each additional pair of Type I exits. Thus the increase in the number of passenger seats allowed, if one additional pair of Type I exits were installed, varies from 45 to 70, depending on the initial airplane exit configuration and the total passenger seating capacity.

The additional passenger seating capacity gained by adding a pair of Type III exits varies in a similar manner. The first table of § 25.807(d)(1) currently allows 79 passenger seats if one pair of Type I and one pair of Type III exits are installed. If one more pair of Type III exits were installed, the allowable number of passenger seats would be increased by 30 to a total of 109 passenger seats. In contrast, two pair of Type I exits and one pair of Type III exits are currently required for a maximum seating capacity of 139. Adding a pair of Type III exits would allow a maximum seating capacity of 179, an increase of 40 passenger seats. For configurations beyond 179 passengers, the second table of § 25.807(d) allows an increase of 35 passenger seats for each additional pair of Type III exits.

When the exit configurations and maximum passenger capacities specified in the first table of § 25.807(d)(1) are compared with the combined ratings specified in the second table of § 25.807(d)(2) for the same combination of exit types, it can be seen that the maximum capacities for the first two configurations (19 and 39 passengers) are conservative when compared to the assigned ratings. They are in close agreement for the next two configurations (79 and 109) and generous for the two largest configurations (139 and 170). A similar comparison can not be made for Type IV exits since no ratings are established for those exits in the second table.

As proposed in Notice 90–4, § 25.807 would be revised to provide one simple, consistent set of standards while still retaining an equivalent level of safety. The exit ratings for Type I, Type II, Type III and Type A exits would be the same as those currently shown in the second table of § 25.807(d)(1) for those types. Type IV exits would be assigned a passenger rating of nine to be consistent with the maximum passenger capacity currently shown in the first table of § 25.807(d)(1). Replacing the exiting tables with specific ratings for each type of exit would enable the airplane manufacturer to design an airplane with any combination of exits the manufacturer chooses, subject to specific constraints. The following constraints, which would be contained in § 25.807(g), were proposed to ensure that the margin of safety currently

associated with passenger capacities of approximately 40 and fewer passenger seats would be retained and that there would be no significant increases in passenger seating permissible with the various combinations of exit types. In addition, unacceptable alternative combinations of exits, such as one pair of Type A exits and three pairs of Type III exits for a maximum passenger seating of 215 are precluded.

The first table of § 25.807(d)(1) currently places several limitations on the passenger emergency exit configuration. For example, the table does not permit the use of Type IV exits in airplanes with more than 9 seats. There must be at least two pairs of exits for any passenger seating configuration above 19, and there must also be at least one pair of Type I or larger exits for passenger seating capacities of 40 or more. As proposed in Notice 90–4, these and other limitations concerning the type and number of exits required for specific passenger seating configurations would be retained. The existing requirement that there must be at least one pair of Type I or larger exits in each side of the fuselage for passenger seating configurations of 40 or more would be retained except that it would apply to passenger seating configurations of 41 or more rather than 40 or more. The existing requirement that there must be at least two Type I or larger exits in each side of the fuselage for passenger seating configurations of 110 or more would also be retained except that it would apply to passenger seating configurations of 111 or more.

The FAA reviewed the results of previous evacuation demonstrations involving airplanes with two adjacent Type III exits on each side of the fuselage. From this review, it was noted that two adjacent Type III exits consistently fail to provide a rate of egress that is double that of a single Type III exit. Typically, some evacuees fail to bypass one exit in order for there to be a steady flow through the adjacent exit. The rate of egress through the exit that some evacuees must bypass is generally equal to that through a single similar exit, but the rate of egress through the second exit is consistently less. The FAA, therefore, proposed in Notice 90–4 that the combined passenger rating of two adjacent pairs of Type III exits would be limited to 65. For purpose of compliance with this requirement, two Type III exits separated by fewer than three passenger seat-rows would be considered to be adjacent (i.e. fewer than three seat-rows plus two passageways located between adjacent vertical edges of the two exits). The pertinent parameter is the number of seat rows; however, with typical row spacing this would be about 80 to 90 inches between adjacent vertical edges of the two exits. (Notice 90–4 quoted 90 to 100 inches; however, 80 to 90 inches is more likely.) It was also proposed that the combined passenger rating for all Type III exits would not exceed 70. Depending on whether the first two pairs were eligible for the full 70 passenger rating, no or very little additional credit would be given for any additional pairs of Type III exits. An additional conservatism in Type III exits because the widths of the accesses to the Type III exits in the studied evacuation demonstrations were far less than that required today because of recent safety regulatory changes.

Taking both the exit ratings and the specific constraints proposed in § 25.807(g), the practical effect of the proposed changes on airplanes with 179 or fewer passenger seats would be as follows:

(a) With 1 through 9 passenger seats, the table of § 25.807(d)(1) specifies at least one Type IV exit in each side. That requirement would remain unchanged. The table of § 25.807(d)(1) notwithstanding, § 25.807(d)(4) currently specifies that an exit meeting at least the dimensions of a Type III exit must be installed in each side if the vertical location of the wing does not allow the installation of overwing exits. That requirements would be retained in proposed § 25.807(g)(1).

(b) With 10 through 19 passenger seats, the table of § 25.807(d)(1) specifies at least one Type III exit in each side. That requirement would remain unchanged.

(c) With 20 through 39 passenger seats, the first table of § 25.807(d)(1) specifies at least one Type II and one Type III exit in each side even though the combined ratings shown in the second table of that section would total 75 passenger seats. The combined ratings of proposed § 25.807(g) would also total 75 passenger seats for this combination of passenger seats; however, the number of passenger seats permissible with this combination of exit types would be limited to 40 by proposed § 25.807(g)(5). That would be one more passenger seat than currently permitted by this combination of exit types. The margin of safety provided by the current rule would be maintained since 40 passenger seats is only 53% of the combined ratings of that combination of exit types.

(d) With 40 through 79 passenger seats, the table of § 25.807(d)(1) specifies at least one Type I and one Type III exit in each side. As proposed, the exit combination currently specified for airplanes with 20 to 39 seats could also be used for one with 40 passenger seats. As in the case described above, a number of different combinations of smaller exit types might provide sufficient combined passenger ratings for airplanes with 41 through 79 passengers; however, those combinations would be precluded by the constraints contained in proposed § 25.807(g). Proposed § 25.807(g)(5) would specify that, for more than 40 seats, there must be at least two exits in each side and that one of those must be at least a Type I exit. That would preclude for example, an alternative configuration of one smaller Type II exit and two Type III exits in each side even though the combined passenger ratings show in proposed § 25.807(g) for that combination of exits would total 105 or 110 passenger seats. It would also preclude an arrangement with only one large Type A or Type B exit in each side in lieu of the Type I and Type III exits. As proposed, the combination of exit types currently specified for airplanes with 41 through 79 passenger seats could also be used for an airplane with 80 passenger seats.

(e) With 80 through 109 passenger seats, the table of § 25.807(d)(1) specifies at least one Type I and two Type III exits in each side. As proposed, the combination of exit types for airplanes with 40 through 79 passenger seats could also be used for those with 80 passenger seats. Although the specific constraints of proposed § 25.807(g) would preclude certain undesirable combinations of exit types, the proposed changes would allow a degree of flexibility in the 81 through 109 passenger seat range. For example, two of the newly proposed Type C exits could be used in lieu of one Type I and two III exits. Also, two Type I exits could be used in lieu of one Type I and two Type III exits provided the number of passenger seats did not exceed 90. As proposed, the combination of exit types currently specified for 80 through 109 seats could also be used for airplanes with up to 110 passenger seats; or 115 passenger seats if the Type III exits were separated sufficiently to enhance their effectiveness.

(f) With 110 through 139 seats, the table of § 25.807(d)(1) specifies at least two Type I exits and one Type III exit in each side. As proposed, the combination of exits currently specified for airplanes with 80 through 109 passenger seats, could be used for those with 110 passenger seats. The combined passenger ratings of proposed § 25.807(g) would limit the exit combination currently specified for 110 through 139 passenger seats to 125

seats. Proposed § 25.807(g)(6) would specify that, for more than 110 seats, there must be at least two Type I or larger exits in each side. For airplanes with 111 through 125 there would be considerable additional flexibility in the combination of exit types used; however, the specific constraints of § 25.807(g) would preclude certain undesirable combinations of exit types. For example, proposed § 25.807(g)(6) would require the emergency exits of airplanes with more than 110 passengers to include at least two Type I exits in each side. For airplanes with more than 125 passenger seats, there would have to be more or larger exit types than those currently required for airplanes with 110 through 139 passenger seats. The choice of additional or larger exit types would, of course, be subject to the combined passenger ratings and specific constraints of proposed § 25.807(g).

(g) With 140 through 179 passenger seats, the table of § 25.807(d)(1) specifies at least two Type I exits and two Type III exits in each side. The combined passenger rating of proposed § 25.807(g) would limit this exit combination to 160 seats. Proposed § 25.807(g)(7) would further limit this exit combination to 155 seats if the Type III exits were not separated sufficiently to enhance their effectiveness. Proposed § 25.807(g)(6) would specify that there must be at least two Type I exits or larger in each side. That would preclude an alternative configuration in which no exits are larger than Type II. It would also preclude a combination of exits involving only one exit larger than Type I and several smaller Type III exits in each side. For airplanes with more than 160 passenger seats, larger or additional exits would have to be provided. The choice of additional or larger exit types would be subject to the combined passenger ratings and specific constraints of proposed § 25.807(g); however, this range of passenger seats would be afforded the greatest flexibility in the choice of exit type combinations.

In summary, the number of passenger seats permissible with one pair of Type II and one pair to Type III exits would be increased from 39 to 40. Similarly, the number permissible with one pair of Type I and one pair of Type III exits would be increased from 79 to 80. The increase would be negligible in either case insofar as the egress capability of the exits is concerned; however, it would be more than compensated for by the proposed improvement in escape slide deployment time in any event. The number permissible with one pair of Type I exits and two pairs of Type III exits would be increased from 109 to either 110 or 115, depending on the proximity of the Type III exits. Those increases would also be negligible insofar as the egress capability of the exits is concerned, but they too would be more than compensated by the proposed improvement in escape slide deployment time. With two pairs of Type I exits and one pair of Type III exits, the permissible number would be significantly decreased from 139 to 125; with two pairs of Type I exits and two pairs of Type III exits, it would be significantly decreased from 179 to either 155 or 160, again depending on the proximity of the Type III exits. The permissible number of passenger seats would remain unchanged for other exit combinations. As stated above in the preamble, these new maximum passenger capacities are calculated by summing the number of passengers rated for the specific types of exit pairs; these ratings are identical to those in the former § 25.807(d)(1) for increases in seating configurations beyond 179.

As noted above, § 25.807(d)(2) currently specifies that each exit must be a Type A or Type I exit for passenger seating capacities over 299. That limitation was introduced, along with the definition of Type A exits, with Amendment 25–15 (32 FR 13255, September 20, 1967), when the first wide-body airplanes were being proposed. Because those airplanes were to have twin aisles, the large Type A exits were adopted to permit simultaneous side-by-side egress of passengers from both aisles. Although there was no operational experience at that time with such airplanes, it was considered that they should not have a large number of small exits. The requirement that all exits be Type A or Type I was intended to discourage interior arrangements with numerous Type III exits and fewer large exits. Subsequently, the Boeing Model 767 and certain configurations of the Airbus Model A310 were both approved with one or two pairs of Type III exits under the equivalent level of safety provisions of § 21.21(b)(1). Evacuation demonstrations and actual evacuations under emergency conditions with those airplanes have shown that a limited number of Type III overwing exits can be effective in twin-aisle airplanes. The FAA, therefore, proposed in Notice 90–4 to permit limited use of Type III exits in airplanes with passenger seating capacities greater than 299. Subsequent to Notice 90–4, § 25.807(d)(5) was adopted with Amendment 25–72 to permit an alternate emergency exit configuration provided the overall evacuation capability is shown to be equal or greater than that specified. As a result, the proposed change is no longer substantive.

To ensure that adequate evacuation capability is maintained if a primary exit becomes unusable, the FAA proposed in Notice 90–4 that at least two pairs of the larger exits (Type A or, as described below, Type B or Type C) would have to be installed to receive full passenger seating credit for those exits. If only one pair of Type A, B, or C exits were installed, the exits would be considered to be Type I exits and credited accordingly.

In order to provide greater flexibility in passenger emergency exit design, two new exit types, Type B and Type C, were proposed in Notice 90–4. Both types would be larger than Type I exits but smaller than Type A exits. They would be similar to exits that have been previously approved by exemption or under the equivalent level of safety provisions of § 21.21(b)(1).

The proposed Type B exits would be required to meet the same criteria as those for Type A exits except that their minimum width would be 32 inches in lieu of 42 inches, and the maximum allowable corner radii would be six inches in lieu of seven inches. Like Type A exits, Type B exits would have to have passageways at least 36 inches wide leading from each main aisle and be equipped with dual-lane escape slides. Based on the egress rate demonstrated by the petitioner, Exemption No. 1573 was granted to permit a passenger rating of 80 for a pair of these exits in the McDonnell Douglas Model DC–10. Similar exit pairs installed later in one configuration of the Boeing Model 757 were given a passenger rating of 75 based on the egress rate demonstrated at that time. That installation was approved under the equivalent safety provisions of § 21.21(b)(1).

The passenger flow to, through and from the proposed Type B exits is similar to that through the wider Type A exits except that the two parallel lines of evacuees typically twist their shoulders a few degrees for the moment in which they are passing through the exit side-by-side. The proposed passenger rating of Type B exits would be 68% that of the larger Type A exits. In essence, the difference between the proposed passenger rating of Type B exits and that of Type A exits reflects this momentary partial merging of the two parallel lines of evacuees as they pass through Type B exits.

In a report entitled Study of FAR 25.807(c) Emergency Exits dated May 1975, the FAA Civil Aeromedical Institute (CAMI) recommended adding

several exit sizes to the regulations, including two that correspond to the proposed Type B and C exits.

Based on a series of passenger evacuation rate tests conducted with exit widths of 26 to 42 inches, CAMI recommended a passenger rating of 80 for an exit that is 32 inches wide and equipped with a dual-lane escape slide. Because of the differences in motor skills and reaction to situations typically exhibited in testing involving people, there is some variation in the data presented in the CAMI report concerning evacuation rate versus exit size.

Considering the variation in the CAMI test data and the data in which approvals of the DC–10 and Boeing Model 757 doors were based, a passenger rating of 75 was proposed in Notice 90–4 for Type B exits. This would ensure that the passenger rating is appropriate for all such exits regardless of the size of the airplane in which they are installed or minor differences among the exits of different airplane models.

The CAMI testing showed that other exits, similar to Type I exits but with additional width, provide greater passenger egress rates than those with the minimum width of 24 inches. CAMI, therefore, recommended that exit pairs at least 30 inches wide should have a passenger rating of 50—five greater than that for Type I exit pairs with the minimum width of 24 inches. Their recommendation was based on the time of 20 seconds currently allowed for door opening and erection of the assist means. The exits defined as Type C in Notice 90–4 evolved from these CAMI recommendations.

The FAA previously proposed to increase the minimum height of Type I exits to 60 inches; however, as discussed in the preamble to Amendment 25–15 (32 FR 13255, September 20, 1967), the proposal was withdrawn in light of test data showing that the greater height would provide no material improvement in passenger egress rate. This finding was corroborated by later CAMI testing.

As proposed in Notice 90–4, Type C exits would be similar to the existing Type I exits, except that their minimum width, would be 30 inches in lieu of 24 inches. In light of the earlier test results, no increase in minimum height was proposed for Type C exits. In addition, Type C exits would be required to have assist means regardless of how high they are above the ground. (Exits of this size without assist means would be considered Type I exits even though they meet the dimensional requirements for Type C exits.) The maximum time allowed for door opening and erection of the assist means (exit preparation time) would be reduced from 20 seconds to 10 seconds. In addition, the 10-second exit preparation time would have to be demonstrated for non-overwing exits in each of the attitudes corresponding to collapse of one or more legs of the landing gear. Such exits would not be required to have power-assisted means for opening in an emergency, nor automatically deployed slides; however, they would have to be so-equipped, as a matter or practicality, in order to comply with the proposed 10-second preparation time. Nevertheless, such features would not be required, nor needed, if the door could be opened and the assist means erected within 10 seconds without them.

In order to arrive at the passenger rating proposed in Notice 90–4, experience with similar exits was considered. Exemption No. 3639, which was granted for the British Aerospace Model BAe.146, allows a maximum passenger seating capacity of 109 with two exit pairs, or a passenger rating of 54.5 per exit pair. These exits are all 30.5 inches wide, and those on the left side are 58 inches high. Due to considerations other than emergency egress, those on the left side are 72 inches high. They are equipped with assist means in the form of automatically deployed, inflatable, self-supporting escape slides.

In another configuration, the Boeing Model 757 was approved for as many as 219 passenger seats, with four exits on each side of the airplane, or approximately 55 passenger seats per exit. Three of the four exits on each side are similar to the proposed Type C exits. Exits Nos. 1, 2, and 4 are over 30 inches in width and have power assist means for opening in an emergency. It was demonstrated during full-scale demonstrations that these exits could be opened and ready to accept evacuees in approximately 8.2 seconds. The No. 3 exit is less than 30 inches in width; however it does exceed the minimum width for a Type I exit. That exit was demonstrated to be usable within 12 seconds.

In view of the testing conducted by CAMI and the consistency of those test results with the approvals of British Aerospace BAe.146 and Boeing 757 airplanes, a passenger rating of 55 was proposed in Notice 90–4 for Type C exits.

A number of conforming changes to other sections were also proposed to include references to Types B and C exits as well as the existing types.

The FAA also proposed in Notice 90–4 to make extensive non-substantive changes to enhance the clarity of those sections involved with emergency exits. In light of the changes already adopted by Amendment 25–72, some are no longer relevant; those remaining would not impose any additional burden on any persons.

Escape Slide Deployment

The FAA proposed in Notice 90–4 to revise § 25.809 to require that the assist means at all Type C exits must be erected within 10 seconds from the time the exit opening means is actuated. The FAA also proposed to reduce the maximum permissible erection times for the assist means serving other exit types. For non over-wing exits, the assist means would have to be fully erected within 6 seconds. This would reduce the time available to prepare the escape system to accept evacuees in any emergency by 4 seconds. For off-wing assist means, the FAA proposed that they must be fully erected within 10 seconds. This would be consistent with the interval currently specified in TSO C69b. As noted above, these erection times are in addition to the interval permitted by § 25.809(b)(2) for exit opening.

Discussion of Comments Received in Response to Notice 90–4

Fourteen commenters responded to the invitation in Notice 90–4—five foreign airworthiness authorities; five airplane or equipment manufacturers, or organizations representing such manufacturers; two airline employee unions; an international airline organization; and an individual.

Two foreign airworthiness authorities support the proposed rulemaking without further comment.

The individual commenter recommends that no passenger seat be installed adjacent to an overwing exit. (By ''overwing exit,'' the commenter is undoubtedly referring to a Type III exit since unobstructed passageways were already required for Type II and larger exits at the time the comment was made.) The recommendation is unrelated to the rulemaking proposed in Notice 90–4; however, the subject was fully addressed by recently adopted Amendments 25–76, 121–228 and 135–43 (57 FR 19220, May 4, 1992) which specify unobstructed passageways leading to Type III exits.

Some commenters suggest that any rulemaking resulting from Notice 90–4 should be deferred to the Aviation Rulemaking Advisory Committee (ARAC). The ARAC is a committee of safety experts chartered by the FAA on

February 5, 1991, to develop future proposed safety standards by using a systems-type analysis. Although much of the future proposed rulemaking of this nature will be developed by ARAC, it is not considered appropriate to defer this particular subject to ARAC since the proposed rulemaking has already been developed and published for public comments.

The international airline organization forwarded comments from two foreign airlines. One airline supports the proposed rulemaking, stating that it clarifies the existing rules and has the potential for increased flexibility in aircraft design. The other airline has reservations concerning the proposed slide erection times but supports the other aspects of the proposed rulemaking. The latter airline did not elaborate on its reservations.

Three commenters support the proposed change concerning assist space in the apparent belief that it introduced a new requirement for assist space at exits other than Type A exits. Actually, all exits other than Type A are already required to have such assist space if they are required by § 25.810(a) to have assist means. The only change proposed in this regard was simply a conforming change to add consideration of Type B emergency exits. The recent consolidation of all assist space requirements in § 25.813(b) should preclude further confusion in that regard.

The three commenters also propose that the dimensions of the required assist space should be defined more precisely. Any change of that nature would be beyond the scope of Notice 90–4 and could not be considered at this time; nevertheless, it is being considered for future rulemaking.

Type and Number of Emergency Exits

One commenter believes the passenger ratings of all exit types should be reconsidered. According to the commenter, the ratings are based on obsolete assumptions and are not verified with data from actual evacuations. In particular, the commenter notes that the egress rate of an exit is dependent on the presence and type of assist means. In the same vein, another commenter believes that additional credit should be given for exits not requiring assist means. In light of the successful evacuations that have been accomplished under actual emergency conditions, the FAA does not concur that the present passenger ratings of all exit types are inappropriate as suggested by the first commenter. The FAA does, however, concur that the egress rate of an exit type may be dependent on the presence and type of assist means. Although not specifically stated by either commenter, the egress rate for exit types not requiring assist means is undoubtedly dependent also on the distance from the exit sill to the ground. Nevertheless, any changes beyond those proposed in Notice 90–4 would have to be deferred for future rulemaking. It must be recognized that extensive additional testing would have to be conducted before any changes of this nature could be proposed.

The commenter also suggests that credit should be given for unpaired exits because, according to the commenter, it is quite rare that one side of the airplane is blocked by fire, and usable exits are distributed in a less predictable manner over both sides and the length of the airplane. The FAA does not consider any change in that regard to be appropriate. The unpredictability of fire or other circumstance that might render an exit unavailable is the very reason why credit can not be given for an exit that does not have a counterpart on the opposite side of the airplane. Whether one complete side would be likely to be blocked by fire is not relevant. It is necessary to have a corresponding exit on the opposite side if only one exit is blocked. Contrary to the first commenter's assertion, there have been many instances in which an exit on one side was blocked by fire while its counterpart on the opposite side was clear and usable. The commenter also implies that exits should be distributed over the length of the airplane. It is recognized that there is a practical limit to the lengthwise distribution of exits in smaller airplanes; however, exits are already required to be distributed along the length of the cabin, as well as on either side, to the greatest extent practicable. In regard to the second comment, part 25 does not require the number of exits on both sides to be equal. Due to practical considerations, such as normal passenger entry, service access, etc., the designer may choose to install more openings in one side than the other; however, any opening that does not have a counterpart on the other side is not credited as an emergency exit.

Section 25.807(f)(2) presently states that, unless another location affords a more effective means of passenger evacuation or the airplane has a ventral or tail cone exit, an airplane is only required to have one pair of floor-level exits must have that exit pair located in the rearward part of the passenger compartment. The commenter believes that § 25.807(f)(2) should be removed or amended to emphasize locating the sole pair of floor-level exits in the forward part of the passenger cabin. The FAA concurs that there are some circumstances in which that would be preferable, but not that the forward end of the cabin is a preferable location in general. Several factors must be considered for any particular design, including proximity of the propeller plane, engine inlet or engine exhaust, potential sources of fires, potential fuselage impact damage, etc. Another consideration is that the flight attendant must be stationed near those exits to direct the evacuation. Having the exit pair, and the associated flight attendant, at the rear of the cabin is advantageous in situations where the flightcrew can assist the flight attendant by directing the evacuation from the forward end of the cabin. The FAA does not concur that the commenter's proposed change is appropriate since the rule already permits locating the exits at the forward end of the cabin when that location would, in fact, afford a more effective means of evacuation. Furthermore, it is arguable whether the forward end is predominantly the preferable location, as the commenter believes. In any event, a change of this nature would be beyond the scope of Notice 90–4 and could not be adopted at this time even if it were deemed to have merit.

The same commenter asserts that ventral and tail-cone exits have not contributed to the rapid evacuation of occupants from airplanes during life-threatening situations and questions whether they should remain in part 25 as creditable emergency exits. Contrary to the commenter's assertion, service experience has shown that ventral and tail-cone emergency exits can provide valuable means of emergency egress and should remain as creditable exits.

The commenter further questions whether the current passenger ratings for those exits are appropriate. Another commenter recommends that the passenger rating of ventral emergency exits should be reduced by 50%. That commenter assets the ventral exit would probably be usable only half the time because of possible landing gear failure. This too would go beyond the scope of the notice; however, it must be noted that a change of this nature would be based on flawed logic. The percentage of emergency evacuations in which an exit is usable has no bearing on how many persons can safely pass through it when it is usable. Nevertheless, the commenter's apparent concern is already addressed by current § 25.807(d)(3). That section, which now becomes § 25.807(g)(9), specifies that a ventral exit must provide the same rate of egress as a Type III exit with the airplane in the most adverse exit

opening condition that would result from the collapse of one or more landing gear legs. If the geometry of the airplane is such that the exit would not provide this rate of egress with the most adverse landing-gear failure-condition, no credit is given for the exit.

There is, of course, no assurance that any particular exit, regardless of its type and location, will be available for use in every accident that may occur. As noted above, the standards of part 25 are based on the assumption that only half of the required exits will be usable due to fire, crash damage or other adverse circumstance. There is no need evident at this time to change the passenger rating of either ventral or tail-cone exits, nor any basis on which to establish new ratings. Any future change involving either an increase or a decrease in the passenger ratings for those exit types would have to be based on considerable additional testing.

One commenter expresses concern that the requirement of § 25.807(c)(7) concerning the maximum distance between exits would be removed. (This requirement was contained in § 25.807(d)(7) at the time Notice 90–4 was published; however, it was moved to § 25.807(c)(7) with the adoption of Amendment 25–72.) The omission of this requirement from proposed § 25.807 was actually inadvertent. There was no intention to remove this requirement, and the final rule has been corrected accordingly.

Another commenter recommends that all non-floor level passenger emergency exits should be eliminated (i.e., Types III and IV, ventral and some tail cone exits) and that, in particular, Type III exits should not be used in airplanes with more that 299 passenger seats. The FAA does not concur with the commenter that they should be eliminated altogether. Type III exits were previously permitted in airplanes with as many as 299 seats; and, as discussed above, they can now be used in larger airplanes provided the overall evacuation capability is not diminished. They have proven to be effective means of egress. Due to structural weight and cabin space considerations, it would be impractical to require the use of larger exit types exclusively in lieu of those exits.

As noted above, service experience has shown that ventral and tail-cone exits can provide valuable means of emergency egress and should remain as creditable exits.

As also noted above, Type IV exits are permitted in airplanes with nine or fewer passengers; however, § 25.785(h) requires each passenger entry door in the side of the fuselage to qualify as a Type II or larger emergency exit. Although it can only be considered a Type IV exit when the corresponding exit on the opposite side is also at least a Type IV exit, the opening in one side of the fuselage of an airplane with nine or fewer seats is already required by § 25.783(h) to meet the requirements of at least a Type II exit. It would be extremely impractical from the standpoints of structural weight and lost cabin space to require the exits on both sides of the cabins of airplanes with nine or fewer seats to be Type II or larger exits. Furthermore, the FAA is not aware of any service history indicating that these small exits are not satisfactory for the smaller transport category airplanes.

The rationale given by the commenter for not permitting the use of Type III exits in airplanes with more than 299 passengers is that the floor-level exits may be unusable and that it would be necessary to evacuate more than 299 passengers through a Type III exit. As noted above, the largest passenger rating for any exit pair (Type A) is 110 passengers. An airplane with more than 299 passengers would, therefore, have to have a minimum of three floor-level exit pairs in addition to the pair of Type III exits. As noted earlier, the standards of part 25 are based on the assumption that half of the required exits may be unusable due to fire or crash damage. It is unrealistic to believe that not half, but all six floor-level exits would be rendered unusable in an otherwise survivable crash, as the commenter suggests, leaving only a pair of Type III exits usable. As noted above, the original concern was not the use of Type III exits in the larger airplanes per se; it was actually whether they would be effective in airplanes with twin aisles. As also noted above, experience with Airbus Model A310 and Boeing Model 767 airplanes has shown that Type III exits can be effective in twin-aisle airplanes. (Another commenter states that those exits in the Airbus Model A310 are derated Type I exits rather than Type III exits. Actually the exits provided at the same location in some A310 airplanes are fully qualified as Type I exits. Those provided at that location in other A310 airplanes can only be considered Type III by definition since they fail to meet all of the qualifications of a larger exit type. In any event, the experience gained with those exits is pertinent regardless of how they are identified.)

The commenter supports the establishment of the new Type B exit, but questions whether it is effective enough to support the proposed passenger rating of 75. The commenter expresses concern that the exit may cause a bottleneck in passenger flow, since it could be four inches narrower than the passageway leading to it, and suggests that the passengers rating should be reduced from 75 to 65. Another commenter believes that the difference would cause a bottleneck but, instead of recommending that the passenger rating be reduced, suggests that the width of the passageway should be reduced to 30 inches.

As noted above, the effectiveness of Type B exits has already been demonstrated with such passageways to support passenger ratings of 80 and 75 for Douglas DC–10's and Boeing 757's, respectively; and the more conservative passenger rating of the two was selected for the proposed rule. As shown by previous tests, the effectiveness of a Type B exit is maintained by having two uniform parallel lines of evacuees leading to the exit. Although the exit is not as wide as a Type A exit, the two parallel lines merge at the exit only to the limited extend needed to pass through the exit before continuing as two parallel lines down the assist means (i.e. the inflatable slide). Typically, the evacuees twist their shoulders a few degrees for the moment in which they are passing through the exit side-by-side. The delay due to this momentary merging is reflected in the proposed passenger rating of 75–68% of that of Type A exits. There is no basis to support arbitrarily reducing it further to 65.

Contrary to the second commenter's assertion, reducing the width of the passageway to less than 36 inches would actually be counterproductive. The evacuees could not be expected to maintain two uniform parallel lines in a narrow passageway if doing so would necessitate keeping their shoulders twisted for the entire length of the passageway. The use of a narrower passageway would, therefore, disrupt the orderly flow of parallel lines of evacuees to the exit and result in greatly reduced flow through it.

One commenter believes that an additional exit type should be defined. The proposed additional type would be similar to proposed Type B exits except for the use of a single-lane slide. In the absence of additional test data showing otherwise, it appears that an exit of this nature might provide egress capability no greater than that of the proposed Type C exit. In any event, defining this or any other additional exit type would be beyond the scope of Notice 90–4 and could not be implemented at this time.

A commenter requests that the capacity of a Type B exit be demonstrated by any air carrier

requesting an increase in the number of passenger seats. Compliance with the emergency evacuation requirements of § 25.803 is already required for any increase in maximum seating capacity over that previously shown satisfactory in accordance with that section.

One commenter notes that the proposed maximum corner radii of six inches is inconsistent with the corresponding requirements for other exit types that are functions of the exit width. The commenter further questions whether the maximum corner radii for other exit types is based on the actual width of the exit or on the minimum required width for that particular exit type. The commenter then raises the possibility that the standards should be expressed in terms of minimum sill width, i.e. door width less the corner radii.

In answer to the commenter's question, the corner radii currently specified for other exit types are based on the minimum required width rather than the actual width of the exit. The FAA recognizes that the current presentation could be misinterpreted in that regard and concurs that expressing the maximum corner radii in absolute dimensions is preferable. Although the pertinent parameters are actually the sill width, as the commenter suggests, and corresponding dimension at the top of the exit, it appears that requirements expressed in those terms could easily be misinterpreted, particularly if the door is a nonstandard oval or trapezoidal shape. After carefully considering the three methods of presentation, the FAA has concluded that expressing the requirement in terms of actual corner radii is preferable because it is least likely to be misinterpreted. Accordingly, § 25.807(a) is amended to specify maximum corner radii of 8 inches for Type I exits, 7 inches for Type II, Type III and Type A exits, and 6.3 inches for Type IV exits. For the same reason, § 25.807(g)(9)(ii) specifies corner radii of 7 inches for tail cone exits. The maximum corner radii for Type B exits is 6 inches as proposed and 10 inches for Type C exits. There changes are nonsubstantive because they simply state the same values in a way less likely to be misinterpreted.

The same commenter asserts that maximum corner radii based on the minimum exit width are not consistent with structural design principles (i.e. corner radii should be increased for large cutouts in order to reduce the stress levels). It must be emphasized that the dimensions specified in § 25.807 describe the minimum openings. As stated in § 25.807(d)(5), openings larger than those specified, whether or not of rectangular shape, may be used if the specified rectangular opening can be inscribed within the actual opening. The designer can, therefore, increase corner radii as much as needed for structural or other considerations simply by increasing the overall size of the exit opening sufficiently to allow an opening with the specified length, width and corner radii to be inscribed within the actual opening.

One commenter asserts that the testing conducted by CAMI to support the passenger rating of proposed Type C exit pairs is invalid because a dual lane slide was used. As discussed above, Type B exits are wide enough for the two parallel lines of evacuees to partially merge momentarily while passing through the exit, then continue down the assist means in two parallel lines. Type C exits, on the other hand, are not wide enough for evacuees to form two parallel lines after passing through the exit. No matter how wide the slide is, evacuees continue down the slide in one single file. The width of the assist means, i.e. the slide, used in the CAMI testing of Type C exits is, therefore, irrelevant.

Three commenters do not believe there is justification for requiring Type C exits to have assist means regardless of how close they are to the ground. All of the data presently available to support the passenger rating for Type C exit pairs are based on tests conducted with assist means. In the absence of additional test data showing otherwise, it appears that exits of the dimensions of proposed Type C exits without assist means would not perform any better than Type I exits. In any event, defining exits of those dimensions without assist means would be beyond the scope of Notice 90–4 and could not be undertaken at this time. Designers would be free to install exits of those dimensions without assist means; however, the exits would be considered Type I exits and credited accordingly.

Another commenter supports the development of the Type C exit, but recommends that the passenger rating be reduced from 55, as proposed, to 50. The commenter bases this recommendation on the assertion that more than half of the emergency exits would probably be unavailable in an actual emergency. As noted earlier, the standards in part 25, and those proposed in Notice No. 90–4, are based on the assumption that half of the exits are unusable due to fire, structural damage or other adverse circumstance. The validity of the commenter's assertion that more than half would be unusable has not been established: however, it would be an issue common to all emergency exit types. There is, therefore, no reason to single out Type C exits and to arbitrarily reduce the rating of those exits. Any change based on the assertion that more than half of the exits would be unavailable would be beyond the scope of Notice 90–4 and could not be adopted at this time.

The commenter also makes a number of recommendations in other areas that are beyond the scope of this rulemaking, such as minimizing jamming of exits, dispatch with inoperative doors, optimal width of passageways to exits and assist space for flight attendants. The commenter's recommendation concerning width of passageways leading to exits was addressed, in part, by recently adopted Amendments 25–76, 121–228 and 135–43 (57 FR 19220, May 4, 1992). Any other recommendations, if found to have merit, would have to be the subject of future rulemaking.

One commenter believes that the passenger ratings should be increased for several combinations of Type I, Type II and Type III exits. The commenter cites consistency with the rest of the proposed changes in passenger ratings, apparently in the belief that any exit type should be given the highest passenger rating previously permitted for that type under any circumstances or with any combination of other exit types. The FAA does not concur. The fact that ratings would be changed to remove inconsistencies does not imply that the inconsistencies must be resolved by simply granting the highest rating previously given for an exit type under any circumstance. By the same token, this does not imply that the inconsistencies must be resolved by arbitrarily granting the lowest rating previously given, as other commenters seem to believe.

In order to resolve the inconsistencies, preference was generally given to the more reliable passenger ratings contained in the second table of § 25.807(d)(1). Where substituting the passenger ratings of the second table would have resulted in significant increases for certain combinations of exit types shown in the first table, specific constraints on their use were proposed in § 25.807(g). As a result, there was no significant increase in any instance, an insignificant increase of one passenger seat in three instances, and significant decreases of 14 and 24 seats in two others. As noted above, the increase of one seat would be negligible insofar as the egress capability of the exits is concerned; however, it would be more than compensated for by the proposed

improvement in escape slide deployment time in any event. Although most transport category airplanes are required to have escape slides, some have exits located close enough to the ground that slides are not needed. For those, even more time would be afforded for egress since no time would be needed for slide deployment. No supporting data were presented to justify either greater or lower passenger ratings; therefore, the various exit types are rated as proposed.

Two commenters support the proposed reduction in passenger ratings of closely located Type III exits in proposed § 25.807(g)(7). Another commenter opposes the proposed reduction and believes that the primary considerations are integrity of the access and optimized opening mechanism and hatch weight. The FAA concurs that those are both important considerations; however, they are not relevant to the proposal. As noted above, actual demonstrations show that the rate of egress through one exit is consistently less because some evacuees must bypass the first exit they reach to use that exit.

A third commeter does not support the proposed reduction in passenger ratings of closely located Type III exits because, according to the commenter, extensive full scale evacuation tests have justified the 70 passenger rating of Type III exits regardless of their spacing and the exit flow is determined by the exit opening rather than the aisle flow rate. Again, the comments are not relevant to the proposal. The issue is not whether the aisle is capable of feeding enough evacuees to maintain maximum flow nor whether the rating for Type III exits in general is justified. Instead, the proposed reduction recognizes that some persons, who must bypass the first exit they reach and egress through the other exit for maximum total flow to occur, choose to join the line of evacuees waiting to use the first exit. Spacing exits farther apart and having more passengers seated between them reduces or eliminate altogether the number of passengers who must bypass an exit for maximum total flow.

One commenter believes that the criteria for reduction in the ratings should be 84 inches between exit centerlines rather than three passenger seat rows, based on an assumed minimum seat row pitch of 28 inches. As noted above, three passenger seat rows would typically result in approximately 80 to 90 inches between adjacent vertical edges of the two exits, or 100 or 120 inches between exit centerlines. Regardless of the value chosen, the FAA does not concur because the pertinent parameter is not the measured distance between the exits, per se, but the number of rows (i.e., the number of passengers) located between the exits. The comment does, however, raise the possibility that the phrase ''* * * two Type III exits located within three passenger seat rows of each other * * *'' could be misinterpreted. To preclude any confusion in that regard, § 25.807(g)(7), as adopted, reads'' * * * two Type III exits that are separated by fewer than three passenger seat rows * * *''

One commenter does not concur that the combined credit for all Type III exits should be limited to 70 passengers, i.e., no or very limited credit given for more than two pairs of Type III exits. The commenter notes that it is possible to distribute more than two pairs of Type III exits in airplanes with exceptionally long wing chord, such as supersonic transports.

The FAA is not aware of any previously type-certificated transport category airplane with more than two pairs of Type III exits. Generally, designers have elected to utilize Type III exits only when they can be located over the wing, inherently limiting airplanes to only two such exits because of the limited wing chord length available. As the commenter suggested, it is possible that there may be future airplanes with extremely long wing chords over which more than two pairs of Type III exits could be distributed. Also, it is possible to utilize Type III exits at non-overwing locations. Nevertheless, the use of more than two pairs of Type III exits would be a novel or unusual design feature not envisioned at the time the standards for such exits were developed. Based on information presently available, there are serious doubts as to the viability of multiple pairs of such exits in regard to both access within the cabin and orderly escape from them outside the airplane. In addition, the advisability of fewer larger exits in favor of having more than two pairs of Type III exits is questionable. In the absence of extensive additional testing, the FAA does not concur that the combined credit for all Type III exit pairs should exceed 70 passengers.

One commenter believes that a 42 inch wide escape route is needed for two adjacent Type III exits only when the two exits share a common escape route. (This requirement was proposed as § 25.803(e)(1); however, it would become § 25.810(c)(1) due to the change in editorial structure that resulted from Amendment 25–72.) That was, in fact, the intent of the proposal; however, it appears in light of the comment that ''adjacent'' may result in varying interpretations. To preclude any confusion in this regard, § 25.810(c)(1) refers to a common escape route from two Type III exits rather than an escape route from adjacent Type III exits.

A commenter believes that there is confusion in proposed § 25.785(h) between ''near'' and ''adjacent'' in regard to the proximity of flight attendant seats to Type B exits. Actually, the proposed rule is the same as current § 25.785(h) insofar as use of those terms is concerned.

Contrary to the commenter's assertion that the terms are presently considered interchangeable, the distinction in terminology is used because Type A and, as proposed, Type B exits must meet a higher standard than other floor-level exits. Any flight attendant seats provided must be located in the general vicinity of required floor-level exits; however, there is no requirement to provide a separate flight attendant seat for each floor-level exit other than a Type A exit or, as proposed, a Type B exit. In some instances, the number of required floor-level exits may exceed the number of flight attendant seats provided; in that case, one seated flight attendant would be expected to serve more than one exit, e.g., exits located on opposite sides of the cabin. The seat provided for that flight attendant can be located ''near,'' i.e., in the general vicinity of, both exits, but it would not generally be considered to be located ''adjacent,'' or next to, both exits—particularly if the exits are located on opposite sides of the cabin. For Type A and, as proposed, Type B exits, a flight attendant seat must be provided for each exit and must generally be located next to the exit, not just in the general vicinity. The distinction provided by the terms ''near'' and ''adjacent'' is, therefore, correct.

The same commenter note that proposed § 25.807(e) would require exits to be distributed as uniformly as 'possible,' while earlier language required them to be distributed as uniformly as practicable.'' Actually, the word ''practicable'' was replaced with ''practical'' when the requirement was moved to § 25.813 in Amendment 25–72. The FAA has carefully considered the definition of each of the three terms, as well as the intent of the rule, and has concluded that the present term ''practical'' is appropriate and should be retained. Advisory Circular 25.807–1 provides guidance material concerning compliance with this section.

One commenter objects to the proposed requirement that if a Type A, Type B or Type C exit is installed, there must be at least two Type C or larger exits installed in each side of the

fuselage. The commenter asserts that the requirements for uniformity of passenger exit distribution and the ''certification process'' would ensure that the loss of one exit would not have a critical impact on the evacuation capability of the airplane. As noted above, this requirement was proposed to ensure that adequate evacuation capability would be maintained in the event a primary exit became unusable. In the absence of this proposal, it would be possible for a 145 passenger airplane, for example, to be type certificated with one Type A exit and one Type III exit in each side of the fuselage. If one of the Type A exits was unusable due to fire, structural damage or other adverse circumstance, 38% of the total egress capability would be lost. Similarly, if both Type A exits were unusable, only 24% of the egress capability would remain. Contrary to the commenter's assertion, the requirements for uniformity of passenger exit distribution would not ensure that the loss of one exit would not have a critical impact on the evacuation capability of the airplane.

Escape Slide Deployment

Several commenters object to the times specified for erection of the assist means serving proposed Type C exits; however, none present any factual data to support their apparent contention that more time should be permitted for erection. As discussed above, the proposed erection time is based on the demonstrated capability of current state-of-the-art devices.

One commenter supports the proposed reduction in erection times, but notes that essential equipment should not be relocated to the airplane to achieve those reductions. Since the assist means remains attached to the airplane, there would be no reason to require any essential equipment to be attached to the device insofar as it functions as an assist means. It appears, however, that the commenter is actually referring to dual-purpose inflatable devices, sometimes referred to as slide rafts. Slide rafts are designed to remain attached to the airplane and serve as assist means during an emergency evacuation on land, or to be detached from the airplane and serve as liferafts following a ditching. Section 25.1415(c) currently requires approved survival equipment to be attached to each liferaft, and that requirement would not be affected by any of the changes proposed in Notice 90–4.

Some commenters also object to initiating the measurement of erection time when the means for opening the exit is actuated rather than when erection is begun, as is currently specified for other exit types. It is not clear whether their intent is to achieve a more relaxed total deployment interval by specifying that the device must be fully erect within 10 seconds after erection is begun, or whether they simply object to including exit opening in the time interval regardless of the total time permitted. In contrast, another commenter, a foreign airworthiness authority, recommends that the erection duration and starting time requirements for other types of exits should also be consistent with those proposed for new Type C exits.

As noted above, the proposed erection time is based on current state-of-the-art, and the FAA does not concur that a more relaxed total deployment interval is justified. Including exit actuation time in the total deployment interval actually provides the designer more flexibility in achieving the desired goal. If the exit opening time is especially rapid, there would be more time available for erection of the assist device. On the contrary, if the erection time is especially rapid, there would be more time available for exit opening. The other commenter's recommendation that the erection duration and starting time requirements for other types of exits should be consistent with those proposed for Type C exits appears to have merit. Although it is beyond the scope of Notice 90–4, it will be considered for possible future rulemaking.

One commenter, a manufacturer of inflatable assist means, questions what constitutes when ''deployment is begun'' and suggests the phrase ''actuation of the inflation controls is begun'' be used instead. The commenter notes that the latter phrase is used in Technical Standard Order (TSO) C69b which contains design standards for off-wing escape slides.

Generally, the two phrases are interchangeable since the assist means are inflatable devices. Since TSO–C69b pertains specifically to inflatable devices, the phrase ''actuation of the inflation controls is begun'' is appropriate in that document. Unlike the TSO, part 25 does not require the assist means to be an inflatable device. It would, therefore, be inappropriate to use that phrase in part 25 since the assist means may, in fact, not be an inflatable device. For the same reason, the FAA concurs with another commenter that the phrase ''actuation of the inflation system'' in proposed § 25.809(h) is inappropriate. This requirement, now contained in § 25.810(d)(4), has been changed to read, ''actuation for the erection system.''

Adoption of the Final Rule

As noted above, the editorial structure of certain portions of part 25 was changed considerably subsequent to the publication of Notice 90–4. Except for the substantive changes discussed above and a number of non-substantive changes made for conformity with part 25 as it is not structured, the amendments are adopted as proposed in Notice 90–4.

Final Regulatory Evaluation, Final Regulatory Flexibility Determination, and Trade Impact Assessment

Proposed changes to Federal Regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic effect of regulatory changes on small entities. Third, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. In conducting these analyses, the FAA has determined that this rule: (1) will generate benefits that justify its costs but because of the public interest is a ''significant regulatory action'' as defined in the Executive Order; (2) is ''significant'' as defined in DOT's Regulatory Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; and (4) will not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

Regulatory Evaluation Summary

Exits

Overall, changes to the types and number of required passenger emergency exits will not likely result in significant modifications to cabin interiors nor result in significant cost differentials, either positive or negative. Part 25 airplane exit configurations are variable and are seldom at the maximum limit in terms of passengers per exit. Any increases in costs would be far outweighed by the benefits of enhanced design flexibility, consistency in standards, and improved evacuation capabilities.

The addition of Type B and Type C exits will provide manufacturers with increased design flexibility. Configurations with Types B and C exits will likely cost no more, and potentially less, than configurations without these exits since manufacturers will most

likely not utilize them unless it is cost-effective to do so.

The revisions relating to Type I exits could increase costs in certain instances. The current standards allow an increase in passenger seating configuration ranging from 45 to 70 for each additional Type I exit pair, depending on airplane exit configuration and total passenger seating capacity. The revisions will limit the allowed increase for Type I exit pairs to 45 passengers for all exit configurations and seating capacities.

Limiting Type I exit pairs to 45 passengers will improve safety. It is clear that 45 passengers can evacuate through a pair of Type I exits more expeditiously than can a greater number. An aircraft having two pairs of Type I exits and two pairs of Type III exits can have 179 passengers under the current standards but only 155 passengers under the revised standards, a reduction of 13 percent. However, a manufacturer of a design which includes 179 passengers (with two pairs each of Type I and Type III exits) that desires to maintain that capacity could, under the revised standards, replace the two Type I exit pairs with Type C exit pairs (the two new Type C pairs allow 110 passengers and the two Type III pairs another 70 for a total of 180 passengers). Evacuation from an airplane with the modified configuration would be easier since the Type C exit is six inches wider than the Type I exit. Benefits resulting from this safety enhancement would easily exceed any incremental design/manufacturing costs.

While it is difficult to estimate the number of fatalities or injuries that might be avoided by the revised rule, studies have shown that exit flow rates are proportional to exit widths within the 24 to 42 inch range. In one study, the evacuation rate increased by one occupant every 12 seconds for each six inch increase in exit width (''Study of FAR § 25.807(c) Emergency Exits,'' FAA Aeronautical Center, May 1975, Project Report No. 70–597–120A). In another study, the National Bureau of Standards (NBS) (since renamed the National Institute for Standards and Technology), analyzed accidents involving fire and fatalities that occurred between 1965 and 1982 and estimated the number of fatalities that could have been avoided if passengers had additional time to escape as a result of reduced seat cushion flammability ('Decision Analysis Model for Passenger-Aircraft Fire Safety with Application to Fire Blocking of Seats,'' National Bureau of Standards, March 1984, NBSTR 84–2817, DOT/FAA/CT/84–8). NBS estimated that of 712 fire fatalities during the period analyzed, 109 could have been avoided if there had been 20 additional seconds of evacuation time (a rate of 3 lives saved per 100 million passenger enplanements). While having more time to evacuate an airplane is not the same as being able to evacuate an airplane faster, it can nevertheless serve as a proxy for estimating benefits, because the end result is the same—more passengers can egress before fire or explosion makes egress impossible. Reduced crowding at exits and the consequent decrease in evacuation time resulting from the revised exit standards could potentially save several lives in just one accident.

Escape Slides

The reduced time allowed for escape slide erection will provide faster emergency evacuation rates and potentially prevent some fatalities or injuries that otherwise might be sustained. The technology to meet the revised standard is available and will not add to the cost of slides. The rule changes basically update slide requirements to current technology. Since costs will be unaffected and safety enhanced, the revisions are cost beneficial.

Regulatory Flexibility Determinations

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by Government regulations. The FRA requires agencies to assess whether rules would have ''a significant economic impact on a substantial number of small entities,'' and in cases where they would, to conduct a Regulatory Flexibility Analysis. The FAA size threshold for a small aircraft manufacturer is 75 or fewer employees (per FAA Order 2100.14A, Regulatory Flexibility Criteria and Guidance). Since there are no manufacturers of part 25 airplanes with 75 or fewer employees, the rule will not have ''a significant economic impact on a substantial number of small entities.''

International Trade Impact Assessment

The rule will have no effect on the sale of U.S. airplanes in foreign markets or the sale of foreign airplanes in the U.S.

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 a ''significant'' regulation as defined in Executive Order 12866 and is ''significant'' as defined in Department of Transportation Regulatory Policies and Procedures (44 FR 11034; February 26, 1979) because of the public interest involved. In addition, it is certified under the criteria of the Regulatory Flexibility Act that this regulation will not have a significant economic impact, positive or negative, on a substantial number of small entities.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

Adoption of Amendment

Accordingly, the FAA amends 14 CFR part 25 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. 106(g), 40113, 44701, 44702 and 44704.

2. By amending § 25.783 by revising paragraph (h) to read as follows:

§ 25.783 Doors.

* * * * *

(h) Each passenger entry door in the side of the fuselage must meet the applicable requirements of §§ 25.807 through 25.813 for a Type II or larger passenger emergency exit.

* * * * *

3. By amending § 25.785 by revising paragraph (h)(1) to read as follows:

§ 25.785 Seats, berths, safety belts, and harnesses.

* * * * *

(h) * * *

(1) Near a required floor level emergency exit, except that another location is acceptable if the emergency egress of passengers would be enhanced with that location. A flight attendant seat must be located adjacent to each Type A or B emergency exit. Other flight attendant seats must be evenly distributed among the required floor-

level emergency exits to the extent feasible.

* * * * *

4. By amending § 25.807 by revising paragraphs (a)(1) through (a)(4), (a)(7), and (d) through (f) and by adding paragraphs (a)(8), (a)(9), and (g) through (i) to read as follows:

§ 25.807 Emergency exits.

(a) * * *

(1) *Type I.* This type is a floor-level exit with a rectangular opening of not less than 24 inches wide by 48 inches high, with corner radii not greater than eight inches.

(2) *Type II.* This type is a rectangular opening of not less than 20 inches wide by 44 inches high, with corner radii not greater than seven inches. Type II exits must be floor-level exits unless located over the wing, in which case they must not have a step-up inside the airplane of more than 10 inches nor a step-down outside the airplane of more than 17 inches.

(3) *Type III.* This type is a rectangular opening of not less than 20 inches wide by 36 inches high with corner radii not greater than seven inches, and with a step-up inside the airplane of not more than 20 inches. If the exit is located over the wing, the step-down outside the airplane may not exceed 27 inches.

(4) *Type IV.* This type is a rectangular opening of not less than 19 inches wide by 26 inches high, with corner radii not greater than 6.3 inches, located over the wing, with a step-up inside the airplane of not more than 29 inches and a step-down outside the airplane of not more than 36 inches.

* * * * *

(7) *Type A.* This type is a floor-level exit with a rectangular opening of not less than 42 inches wide by 72 inches high, with corner radii not greater than seven inches.

(8) *Type B.* This type is a floor-level exit with a rectangular opening of not less than 32 inches wide by 72 inches high, with corner radii not greater than six inches.

(9) *Type C.* This type is a floor-level exit with a rectangular opening of not less than 30 inches wide by 48 inches high, with corner radii not greater than 10 inches.

* * * * *

(d) *Asymmetry.* Exits of an exit pair need not be diametrically opposite each other nor of the same size; however, the number of passenger seats permitted under paragraph (g) of this section is based on the smaller of the two exits.

(e) *Uniformity.* Exits must be distributed as uniformly as practical, taking into account passenger seat distribution.

(f) *Location.* (1) Each required passenger emergency exit must be accessible to the passengers and located where it will afford the most effective means of passenger evacuation.

(2) If only one floor-level exit per side is prescribed, and the airplane do not have a tail-cone or ventral emergency exit, the floor-level exits must be in the rearward part of the passenger compartment unless another location affords a more effective means of passenger evacuation.

(3) If more than one floor-level exit per side is prescribed, and the airplanes does not have a combination cargo and passenger configuration, at least one floor-level exit must be located in each side near each end of the cabin.

(g) *Type and number required.* The maximum number of passenger seats permitted depends on the type and number of exits installed in each side of the fuselage. Except as further restricted in paragraphs (g)(1) through (g)(9) of this section, the maximum number of passenger seats permitted for each exit of a specific type installed in each side of the fuselage is as follows:

Type A	110
Type B	75
Type C	55
Type I	45
Type II	40
Type III	35
Type IV	9

(1) For a passenger seating configuration of 1 to 9 seats, there must be at least one Type IV or larger overwing exit in each side of the fuselage or, if overwing exits are not provided, at least one exit in each side that meets the minimum dimensions of a Type III exit.

(2) For a passenger seating configuration of more than 9 seats, each exit must be a Type III or larger exit.

(3) For a passenger seating configuration of 10 to 19 seats, there must be at least one Type III or larger exit in each side of the fuselage.

(4) For a passenger seating configuration of 20 to 40 seats, there must be at least two exits, one of which must be a Type II or larger exit, in each side of the fuselage.

(5) For a passenger seating configuration of 41 to 110 seats, there must be at least two exits, one of which must be a Type I or larger exit, in each side of the fuselage.

(6) For a passenger seating configuration of more than 110 seats, the emergency exits in each side of the fuselage must include at least two Type I or larger exits.

(7) The combined maximum number of passenger seats permitted for all Type III exits is 70, and the combined maximum number of passenger seats permitted for two Type III exits in each side of the fuselage that are separated by fewer than three passenger seat rows in 65.

(8) If a Type A, Type B, or Type C exit is installed, there must be at least two Type C or larger exits in each side of the fuselage.

(9) If a passenger ventral of tail cone exit is installed and that exit provides at least the same rate of egress as a Type III exit with the airplane in the most adverse exit opening condition that would result from the collapse of one or more legs of the landing gear, an increase in the passenger seating configuration is permitted as follows:

(i) For a ventral exit, 12 additional passenger seats.

(ii) For a tail cone exit incorporating a floor level opening of not less than 20 inches wide by 60 inches high, with corner radii not greater than seven inches, in the pressure shell and incorporating an approved assist means in accordance with § 25.810(a), 25 additional passenger seats.

(iii) For a tail cone exit incorporating an opening in the pressure shell which is at least equivalent to a Type III emergency exit with respect to dimensions, step-up and step-down distance, and with the top of the opening not less than 56 inches from the passenger compartment floor, 15 additional passenger seats.

(h) *Excess exits.* Each emergency exit in the passenger compartment in excess of the minimum number of required emergency exits must meet the applicable requirements of § 25.809 through § 25.812, and must be readily accessible.

(i) *Ditching emergency exits for passengers.* Whether or not ditching certification is requested, ditching emergency exits must be provided in accordance with the following requirements, unless the emergency exits required by paragraph (g) of this section already meet them:

(1) For airplanes that have a passenger seating configuration of nine or fewer seats, excluding pilot seats, one exit above the waterline in each side of the airplane, meeting at least the dimensions of a Type IV exit.

(2) For airplanes that have a passenger seating configuration of 10 of more seats, excluding pilot seats, one exit above the waterline in a side of the airplane, meeting at least the dimensions of a Type III exit for each unit (or part of a unit) of 35 passenger seats, but no less than two such exits in the passenger cabin, with one on each side of the airplane. The passenger seat/

exit ratio may be increased through the use of larger exits, or other means, provided it is shown that the evacuation capability during ditching has been improved accordingly.

(3) If it is impractical to locate side exits above the waterline, the side exits must be replaced by an equal number of readily accessible overhead hatches of not less than the dimensions of a Type III exit, except that for airplanes with a passenger configuration of 35 or fewer seats, excluding pilot seats, the two required Type III side exits need be replaced by only one overhead hatch.

5. By amending § 25.810 by revising paragraphs (a) introductory text, (a)(1) introductory text, (a)(1)(ii), (b), (c)(1), and (d) to read as follows:

§ 25.810 Emergency egress assist means and escape routes.

(a) Each non over-wing Type A, Type B or Type C exit, and any other non over-wing landplane emergency exit 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.

(1) The assisting means for each passenger emergency exit must be a self-supporting slide or equivalent; and, in the case of Type A or Type B exits, it must be capable of carrying simultaneously two parallel lines of evacuees. In addition, the assisting means must be designed to meet the following requirements—

* * * * *

(ii) Except for assisting means installed at Type C exits, it must be automatically erected within 6 seconds after deployment is begun. Assisting means installed at Type C exits must be automatically erected within 10 seconds from the time the opening means of the exit is actuated.

* * * * *

(b) Assist means from the cabin to the wing are required for each type A or Type B exit located above the wing and having a stepdown unless the exit without an assist-means can be shown to have a rate of passenger egress at least equal to that of the same type of non over-wing exit. If an assist means is required, it must be automatically deployed and automatically erected concurrent with the opening of the exit. In the case of assist means installed at Type C exits, it must be self-supporting within 10 seconds from the time the opening means of the exits is actuated. For all other exit types, it must be self-supporting 6 seconds after deployment is begun.

(c) * * *

(1) The escape route from each Type A or Type B passenger emergency exit, or any common escape route from two Type III passenger emergency exits, must be at least 42 inches wide; that from any other passenger emergency exit must be at least 24 inches wide; and

* * * * *

(d) Means must be provided to assist evacuees to reach the ground for all Type C exits located over the wing and, if the place on the airplane structure at which the escape route required in paragraph (c) of this section terminates is more than 6 feet from the ground with the airplane on the ground and the landing gear extended, for all other exit types.

(1) If the escape route is over the flap, the height of the terminal edge must be measured with the flap in the takeoff or landing position, whichever is higher from the ground.

(2) The assisting means must be usable and self-supporting with one or more landing gear legs collapsed and under a 25-knot wind directed from the most critical angle.

(3) The assisting means provided for each escape route leading from a Type A or B emergency exit must be capable of carrying simultaneously tow parallel lines of evacuees; and, the assisting means leading from any other exit type must be capable of carrying as many parallel lines of evacuees as there are required escape routes.

(4) The assisting means provided for each escape route leading from a Type C exit must be automatically erected within 10 seconds from the time the opening means of the exit is actuated, and that provided for the escape route leading from any other exit type must be automatically erected within 10 seconds after actuation of the erection system.

6. By amending § 25.811 by revising the introductory texts of paragraphs (e)(2) and (e)(4) to read as follows:

§ 25.811 Emergency exit marking.

* * * * *

(e) * * *

(2) Each Type A, Type B, Type C or Type I passenger emergency exit operating handle must—

* * * * *

(4) Each Type A, Type B, Type C, Type I, or Type II passenger emergency exit with a locking mechanism released by rotary motion of the handle must be marked—

* * * * *

7. By amending § 25.812 by revising paragraph (g)(1)(ii) to read as follows:

§ 25.812 Emergency lighting.

* * * * *

(g) * * *

(1) * * *

(ii) Not less than 0.05 foot-candle (measured normal to the direction of incident light) along the 30 percent of the slip-resistant portion of the escape route required in § 25.810(c) that is farthest from the exit for the minimum required width of the escape route; and

* * * * *

8. By amending § 25.813 by revising paragraphs (a) introductory text, (a)(1), and (b) to read as follows:

§ 25.813 Emergency exit access.

* * * * *

(a) There must be a passageway leading from the nearest main aisle to each Type A, Type B, Type C, Type I, or Type II emergency exit and between individual passenger areas. Each passageway leading to a Type A or Type B exit must be unobstructed and at least 36 inches wide. Passageways between individual passenger areas and those leading to Type I, Type II, or Type C emergency exits must be unobstructed and at least 20 inches wide. Unless there are two or more main aisles, each Type A or B 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 or 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 or B exit; and

* * * * *

(b) Adequate space to allow crewmember(s) to assist in the evacuation of passengers must be provided as follows:

(1) The assist space must not reduce the unobstructed width of the passageway below that required for the exit.

(2) For each Type A or Type B exit, assist space must be provided at each side of the exit regardless of whether a means is required by § 25.810(a) to assist passengers in descending to the ground from that exit.

(3) Assist space must be provided at one side of any other type exit required by § 25.810(a) to have a means to assist passengers in descending to the ground from that exit.

* * * * *

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David R. Hinson,

Administrator.

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