

Federal Aviation Administration

FAR Final Rule

[Federal Register: September 20, 1967 (Volume 32, Number 182)]
[Page 13255]

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
14 CFR Parts 21 and 25
[Docket No. 7522; Amendment No. 21-16, 25-15]

Crashworthiness and Passenger Evacuation Standards; Transport Category Airplanes

AGENCY: Federal Aviation Administration, DOT
ACTION: Amendments
14 CFR Part 21, 25, 37, and 121
Amendment No. 21-16, 25-15, 37-14, 121-30

SUMMARY: The purpose of these amendments is to improve the emergency evacuation equipment requirements and operating procedures for transport category airplanes.
EFFECTIVE DATE: October 24, 1967.

SUPPLEMENTARY INFORMATION:

These amendments are based on a notice of proposed rule making (31 F.R. 10275, July 29, 1966), circulated as Notice No. 66-26 dated July 26, 1966, and on a supplement to notice of proposed rule making (31 F.R. 11725, Sept. 7, 1966), circulated as Notice No. 66-26A dated September 2, 1966.

Numerous comments were received in response to Notice 66-26 and supplemental Notice 66-26A. Based upon these comments and upon review within the FAA, a number of changes have been made to the proposed rule. Most of these changes involve rewording and reorganization for greater clarity and consistency. However, certain substantive changes have been made to the proposed regulation that do not require compliance for periods of from 1 to 2 years. While all but a few of these changes fall within the scope of Notices 66-26 and 66-26A, interested persons have not been given the opportunity to comment on the details of the requirements. The issuance of a supplemental notice of proposed rule making to solicit comments upon these was considered. However, comments from the public on the original notices and from within the FAA indicated that the further delays attendant to this course of action would not be in the best interest of those concerned. Consequently, the FAA is issuing a final rule to allow the persons affected by these regulations to proceed with the certification or retrofitting of their airplanes without further delay. Thereafter, the FAA will consider comments on the changes referred to above received from interested persons on or before October 24, 1967, and may further amend the regulations in the light of these comments. The FAA believes that this course of action is justified and is in the best interest of the public.

The amendments incorporated herein are aimed at increasing substantially the probability of occupant survival in an aircraft accident. The FAA will consider additional revisions of the regulations, as advances in the state-of-the-art allow, in order to further increase that probability of survival. To this end, Government and industry development programs have been established to devise new techniques, designs, and equipment. In progress now are developments on: More effective self-extinguishing characteristics for aircraft interior materials; cabin fire suppressant systems; protection from smoke and fumes; gelled fuels; improved emergency lighting and exit conspicuity; and improved evacuation facilities and techniques.

The final amendments and the more pertinent of the comments received in response to the notices are set forth hereinafter.

PART 21

Sections 21.17 and 21.101 are amended as proposed to accommodate the special retroactive requirements incorporated by new Sec. 25.2.

PART 25

Section 25.2. Of key importance in the notice was the provision relating to retroactivity. Proposed Section 25.2 covered special requirements applicable to type certificates and to supplemental type certificates (or amended type certificates) involving increases in passenger seating capacity. There were numerous comments received with respect to this section as proposed and certain of the recommended changes have been adopted.

We agree with one recommendation that Sec. 25.2 be changed to clarify the intent that insofar as supplemental type certificates and amendments to type certificates are concerned, the special requirements are applicable only when there is an increase in passenger seating capacity beyond that already approved under the terms of the basic type certificate. Sec. 25.2 has been amended accordingly.

The preamble to Notice 66-26 explained the intent to make all the proposed regulatory items applicable to airplanes for which an application for a type certificate is made after the effective date of the amendments and to airplanes for which type certificates are issued after the effective date irrespective of the date of application. The same considerations would apply to supplemental type certificates, and amendments to type certificates, involving increase in passenger seating capacity and Sec. 25.2 has been amended to make it clear that the provisions of this section will apply to any such certificate issued after the effective date of this amendment irrespective of the date of application.

It was suggested that because of necessary delays incidental to production engineering and tooling, certain of the regulations not become applicable until 18 months after the effective date of the amendment. The FAA agrees that there is a basis for an 18-month delay with respect to certain of the proposals in the notice. In this connection, we have determined that manufacturers who now have airplane type certification programs underway would be unreasonably burdened if certain of these rules (i.e., those which necessarily involve considerable engineering development and extensive changes in the type design) were to be made effective on the date of amendment as a condition for obtaining a type certificate, and that delaying their effectivity for 18 months would provide a measure of relief not inconsistent with the safety objectives of this rule-making action. Section 25.2 has accordingly been revised to segregate those regulations with which an applicant need not show compliance until 18 months after the effective date of the amendment.

Section 25.721(d). Several commentators recommended clarification of proposed Sec. 25.721(d) with respect to the overloads and to the parts of the fuel system requiring protection. It is the intent of the section to ensure that no part of the fuel system, lines and tanks, located in the fuselage is likely to be damaged by failure of the landing gear due to overload in the vertical plane parallel to the longitudinal axis of the airplane. The proposal has been changed to reflect this intent. For the reasons set forth above, the effective date of this amendment has been postponed for 18 months.

Section 25.783. The purpose of the proposed changes to Sec. 25.783 was to require that all passenger entrance doors in the side of the fuselage qualify as Type I or Type II passenger

emergency exits. Two commentators read the proposed section as introducing substantive changes in the requirements for exits which are covered elsewhere in the regulations and stated that no explanation was given for amending the entire section. We agree with these comments to the extent that the present section should be retained with the addition of a new paragraph covering door requirements as necessary to make them emergency exits.

In connection with the foregoing, the substance of proposed Sec. 25.783(a) has been added to presently effective Sec. 25.783 as new paragraph (g). Moreover, in response to a recommendation, the doors to which the paragraph is applicable have been defined as "entry" doors. With reference to the integral stair, objections were made to the prohibition of an interference with emergency egress after failure of the landing gear. We agree that the emphasis should be placed on ensuring egress. Interference to a degree that will not reduce the effectiveness of emergency egress should not prevent approval of the integral stair, and the paragraph has been so revised. Finally, the proposal has been revised to state that the entry door may also qualify as a Type A emergency exit. The introduction of the Type A exit in this amendment is discussed below in connection with Sec. 25.807.

Section 25.785(c). Various comments on the proposed requirements applicable to sideward facing seats in Sec. 25.785(c) indicated general belief that they were overly strict inasmuch as provision for only one method of compliance was made. The FAA agrees with the comments and has provided an alternative in the form of a safety belt and shoulder harness combination. The FAA also finds merit in a further suggestion that suitable protection may be afforded by energy-absorbing material such as honeycomb, even though it is noncushioned. Section 25.785(c) has been amended to allow the use of such material.

Section 25.803. The purpose of the proposed regulation is to provide for the emergency evacuation of every occupant of an airplane, whether crewmember or passenger. To clarify this aspect of the requirement proposed in Sec. 25.803(c) and to make it consistent with the intent as expressed in the preamble to Notice 66-26 and with Sec. 121.291, Sec. 25.803(c) is amended to require demonstration of evacuation of the maximum number of airplane occupants, including crewmembers, within the given time limit. Since the number of crewmembers may vary, it is reasonably set for purposes of the test at the number required by the applicable operating rules.

In response to a recommendation that the rule state when the demonstration is considered completed, the first sentence of Sec. 25.803(c) has been amended to state that the demonstration is complete when the occupants have been evacuated from the airplane to the ground. The regulation also makes it clear that evacuees using stands or ramps allowed at the wings are considered to be on the ground when they are on the stand or ramp, provided that the acceptance rate of the stand or ramp is no greater than the acceptance rate of the means available on the airplane for descent from the wing during an actual crash situation.

One commentator pointed out that although ventral and tail cone exits are proposed as passenger emergency exits in Sec. 25.807, they are excluded in the evacuation demonstration required in proposed Sec. 25.8803(c). Ventral and tail cone exits were excluded purposely because there is insufficient service experience in the use of these exits as emergency exits. Until more data and experience are accumulated on the effectiveness of these new exit types, the FAA has determined it advisable to preclude their use in the evacuation demonstration. In addition, the FAA cannot accept a recommendation that a new evacuation demonstration be required for passenger seating increases of 15 percent or more, rather than 5 percent as stated in the notice. The 5-percent variation will permit some flexibility, whereas any greater seating increase could reasonably be expected to involve additional exits and equipment, and changes in interior arrangement and should, therefore, require a new evacuation demonstration.

While there is no intent to require a manufacturer to simulate actual crash conditions as a part of his demonstration, nevertheless, a crash condition will be assumed to occur during takeoff. Section 25.803(c)(3) has, therefore, been changed to require that internal doors and curtains be in the configuration simulating normal takeoff. Also, Sec. 25.803(c)(7) has been further amended to make it clear that it is the passengers rather than the crewmembers who may not have the benefit of prior practice or rehearsal in fulfilling the evacuation demonstration requirements.

In addition, some question has been raised as to whether the term "previously approved" referred to approval based on the actual demonstration. Since the proposal was concerned with the need for repeating the demonstration, it should be made clear that by "previously approved" the FAA meant by actual demonstration.

The FAA does not agree with the suggestions that emergency evacuation demonstrations be the sole responsibility of the air carriers or that the manufacturer be required to demonstrate evacuation under the same conditions now imposed on the operators under Part 121. The FAA believes that since the evacuation capability of an airplane, as defined in this regulation, depends to a large degree on the design of that airplane, it is fundamental to the type certification process to ensure that the airplane has the necessary evacuation capability for the maximum passenger capacity for which certification is sought. Furthermore, for the reasons set forth in the preamble to Notice 66-26, since a manufacturer will be demonstrating the basic capability of a new airplane type, it is not necessary that the demonstration be conducted under the detailed conditions regarding crewmember training, operating procedures and similar items that are of concern to an operator. Nor do we find any justification for a recommendation that evacuation times should vary depending on airplane ground attitude since there is no apparent correlation between the degree of evacuation urgency and airplane ground attitude. Likewise, as to the same commentator's recommendation that the manufacturer be permitted to use 50 percent of the exits rather than those on one side of the fuselage, the FAA believes that the language proposed is more appropriate for type certification since it would ensure evaluation of all the required type exits and emergency evacuation installations incorporated in the type design.

Various commentators objected to the proposed 90-second evacuation time. Some indicated it was too long, others that it was not long enough, while still others took exception to any evacuation time requirement. In this matter, the basis for proposing a 90-second limit was covered in the preamble to Notice 66-26, and nothing has been presented in the comments that is persuasive of change. Numerous demonstrations by manufacturers and air carriers have indicated that the 90-second criterion is reasonable at the present, and 90-seconds as proposed is being retained. As evacuation system component and equipment advances permit reductions in evacuation time, the FAA will consider appropriate changes in the requirements.

The requirement for the designation of an escape route by a slip resistant surface as proposed in Sec. 25.812 does not specify an emergency lighting requirement. Therefore, it is considered appropriate to transfer that requirement to Sec. 25.803. In response to comments, the white color proposed for the slip resistant surface has been deleted since other colors can serve the purpose. Further, the rule has been amended to exclude flaps used as slides from the slip resistant surface requirement.

A recommendation that cabin inerting system requirements be added to Sec. 25.803 in order to allow an increase in the evacuation time has not been adopted. Although such a system may have merit, studies, tests and evaluations will be necessary before such standards could be proposed.

Section 25.807. Although there was some concurrence, a majority of the comments received opposed the increase in Type I passenger emergency exit minimum height from 48 to 60 inches as proposed in Sec. 25.807(a)(1). It was the position of those not favoring the change that evacuation effectiveness is not improved with the increased height. In this connection, recent FAA test data likewise indicates that the 60-inch door permits no material improvement in evacuation flow rates. Therefore, since the higher door has not been shown to improve the flow rate of the Type I exit and would cause an increased installation burden on the manufacturers, we believe it advisable to retain the 48-inch minimum Type I exit height currently specified in the regulations.

Section 25.807(a)(5) has been amended, in response to a recommendation for clarification of ventral exit definition, by stating that the "same rate of egress as a Type I exit" refers to a Type I exit with the airplane in the normal ground altitude with the landing gear extended. Likewise, following another recommendation, the definition of tail cone in Sec. 25.807(a)(6) has been broadened to permit "openable" designs rather than "detachable" as proposed.

A number of commentators objected to the emergency exit distribution requirements proposed in Sec. 25.807(c). The FAA agrees that the notice stated an unnecessarily inflexible requirement for multiple floor level exit locations at each end of the cabin and this has been relaxed to allow locations near each end of the cabin. Moreover, when a design incorporates more than one floor level exit on each side of the fuselage, there is some ambiguity as between proposed paragraph (c) and paragraphs (a) (1) and (2) of current Sec. 25.807. We have, therefore, deleted the location requirement for the first Type I or Type II exit as stated in current Sec. 25.807(a) (1) and (2) and substituted a similar requirement for the first floor level exit in Sec. 25.807(c). Finally, as pointed out in the comments, the proposal did not provide for variations made necessary by cargo/passenger configurations and an exception to take care of such situations has been written into the regulation.

For the period of time since Notice 66-26 was published (over 1 year), the design-development of several large transport airplanes had indicated the desirability if not the necessity of incorporating doors whose width permits two-abreast evacuation. Under current regulations, a Type I exit need be only 24 inches wide. However, limited tests to date on an exit, designated the "Type A" emergency exit, measuring 42 by 76 inches, tend to establish that subject to certain conditions, its evacuation rate materially exceeds the combined rate of two standard Type I exits. In connection with the foregoing, there is an industry recommendation that the rule being promulgated make provision for the "Type A" emergency exit under Sec. 25.807(a).

In the light of recent developments relating to large airplanes, the FAA agrees that passenger emergency exit requirements should contain a standard for an exit larger than Type I. Accordingly, Sec. 25.807 is amended to include a new standard for a "Type A" emergency exit. Although the tests previously mentioned were conducted with exits measuring 42 inches wide by 76 inches high, the FAA believes that a reduction in height from 76 to 72 inches would not have a significant effect on emergency evacuation rate. Any proposal to reduce further the exit opening size, however, would necessitate additional test data.

Section 25.807(c)(1) of the notice proposed the number and type of passenger emergency exits for passenger seating capacities up to 339. Industry response was to the effect that the combination of exit types was arbitrary and inconsistent with evacuation capabilities of the larger aircraft; that inadequate credit was allowed for Types II and IV exits, thereby tending to minimize the number of exits; and that the nonlinear assignment of exit credit versus the number of passengers was without sufficient justification. A major objection voiced was that for the new emergency exits being developed in connection with new transports, no credit was available for exits larger than Type I. One commentator recommended that the proposed table of passenger seating capacity versus required number and types of exits be deleted and that the table showing increases in passenger capacity for each type exit be amended to allow credit for Types A, III, and IV and increases for Types I and II from that proposed in the notice. Another commentator recommended retention of the present table of Sec. 25.803(c)(1) as adequate for present size aircraft and pointed out that the proposed table did not reflect proper credit for new double size exits being designed for new large aircraft.

The FAA does not agree that the table in current Sec. 25.807(c)(1) should be deleted in its entirety inasmuch as the current version represents many years experience with passenger configurations up to the 179-passenger limit. However, it has subsequently been determined that there is not sufficient justification for extending the table to 339 passengers. Accordingly, the current table in Sec. 25.807(c)(1) is being retained for seating capacities up through 179 passengers. In addition, the provision set forth in current Sec. 25.807(c)(4) is being retained to permit the passenger emergency exit relationship to be increased by not more than 10 passengers for slides, but has been restricted to airplanes having a passenger seating capacity of 189 or less.

In order to meet the industry request for more flexible and realistic standards for the individual exit types, we have amended the table in Sec. 25.807(c)(4) to credit evacuation capability of 100 passengers for each pair of Type A exits, to increase to 45 and 40 passengers, respectively, the credit for Types I and II exits, and to give a credit of 35 passengers for Type III exits. Furthermore, in keeping with the intent of the notice that airplanes having passenger seating

capacities more than 299 use only the two largest size exits, we have included the requirement that emergency exits be either Type A or Type I on airplanes having passenger capacities in excess of 299. The proposal would have permitted the use of Type I and Type II combination exit arrangement for passenger capacities between 300 and 339. This was based on the fact that the Type II exit required in the notice had to be both floor level and overwing. Since the final rule retains the current requirements for Type II, which are less severe in these respects, the passenger credit for Type II exits above a capacity of 299 has been deleted.

The 100-passenger increase in seating capacity allowed per pair of Type A exits is based on tests conducted to date using both overwing and non-over-wing exits. The value of 100 is conservatively set at 85 percent of the test evacuation capacity of the non-over-wing type and is considered acceptable for all Type A exits inasmuch as the rate of evacuation of the overwing type exit, established by tests, exceeds that of the non-over-wing exit. In connection with the overwing exit, however, the tests were conducted using self-supporting and automatically deployed devices to assist evacuees in reaching the wing surface. Therefore, to ensure that overwing exits having stepdown distances are as effective as non-wing exits, standards have been added relating to assist devices at such overwing exits.

The significant factor in achieving the Type A egress rate, is an adequate flow of passengers to the exit. Certain design features, other than the mere size of the exit, must, therefore, be incorporated in order to realize the effectiveness of the exit. In concept, the Type A exit is a system rather than a mere opening. Configuration requirements are therefore set forth as part of the Type A exit system, concerning, among other things number, location and size of aisles, and passageways, and exterior slides.

Questions on proposed Sec. 25.807(c)(3) (now Sec. 25.807(c)(6)) indicated that it was clear as to what was meant by the phrase "usable following the collapse of one or more legs of the landing gear". The intent of the requirement was to cover the situation of reduced exit effectiveness due to some restriction that would affect egress after the gear failure. The key condition for which usability is required is the critical fuselage attitude after gear failure. The paragraph has been amended, therefore, to make it clear that usability must relate to the airplane in the most adverse exit opening condition following collapse of one or more legs of the landing gear. Our further evaluation indicated that in going from gear normal attitude to critical gear failure attitude, it would be reasonable to specify, as the criterion of usability, that the tail cone or ventral exit must have a rate of egress at least equivalent to that of a Type III exit.

The passenger credit in proposed Sec. 25.807(c)(3)(ii) (now Sec. 25.807(c)(6)(ii)) was predicated on a tail cone exit incorporating, among other things, a Type I size opening 60 inches in height. As discussed previously, however, the Type I height is being retained at 48 inches. Since it is necessary to maintain a walkthrough from the pressure shell to the emergency exit, the 60-inch height must be retained. Section 25.807(c)(6)(ii), therefore, contains the actual dimensions of the required opening in the pressure shell rather than specifying a Type I size opening. A similar situation exists in connection with the proposed requirements for a tail cone exit incorporating a Type III size opening. Again, the intent is that an evacuee be forced to bend over the least to get through the opening so that there is minimum impedance to flow. Accordingly, to preclude floor level Type III size openings and to assure a minimum height, Sec. 25.807(c)(6)(iii) requires that the top of the opening be not less than 56 inches from the passenger compartment floor.

Pointing out that for a tail cone exit incorporating a Type I opening, the rate of egress is at least equivalent to a side mounted Type I exit and that a passenger's ability to mount the slide is enhanced because he doesn't have to clear the exit at the same time, one commentator expressed the belief that the 20-passenger credit in proposed Sec. 25.807(c)(3) was unduly restrictive and unrealistic. Inasmuch as recent tests have substantiated higher egress rates and studies have indicated the reduced vulnerability of the tail cone to obstructions resulting from crash damage or hazards due to wing tank fuel fires, the FAA agrees that the 20-passenger credit is conservative. We believe that the reduced vulnerability of the tail cone exit offsets the fact that there is no requirement for a "back-up" exit and that the passenger credit factor may be approximately the same as for the Type I side mounted exit. Based on the foregoing

considerations, the FAA believes it appropriate to increase the passenger credit of proposed Sec. 25.807(c)(3)(ii) (now Sec. 25.807(c)(6)(ii)) from 20 to 25. Likewise, in connection with ventral exits, a credit for 10 passengers appear conservative. Since the FAA has previously allowed credit for 12 passengers by way of exemption, proposed Sec. 25.807(c)(3)(i) (now Sec. 25.807(c)(6)(i)) is relaxed to allow that higher number.

The FAA agrees with comments as to the impracticability of attempting to regulate, in general, those situations in which the location of the wing does not allow the installation of overwing exits. Each case must be governed by its own special considerations. It would appear that proposed Sec. 25.807(c)(5) could be unnecessarily burdensome if not impossible of accomplishment where the smaller transports are involved. Therefore, the current requirement of Sec. 25.807(c)(5) has been retained and designated as Sec. 25.807(c)(7).

The proposed requirement in Sec. 25.807(c)(4) (now Sec. 25.807(c)(8)) concerning emergency exits in excess of the minimum number of required emergency exits, has been retained. The comments did not present sufficient supporting data to justify deleting this requirement.

As proposed, Sec. 25.807(d)(1)(ii) retained the ditching exit requirements of the like-numbered present regulation governing the minimum size opening for airplanes with a passenger seating capacity of 11 or more. The proposal, furthermore, deleted the Sec. 25.807(d)(3) equivalency provision that permitted substitution of two Type IV exits for each Type III exit. Objections were stated to both the foregoing provisions in that they did not give credit for the new larger Type A exits while at the other extreme, small diameter fuselages may not accommodate openings as large as Type III. While we do not agree that there is sufficient basis to establish a specific passenger ditching credit for the new Type A exit, the FAA believes the regulation as proposed may be broadened to make provision for credit in excess of 35 passengers in a case where the large exits and other improved designs are shown to have better capabilities. However, in view of the changes being made to Sec. 25.807(c), there is no longer any basis for prohibiting the Type IV as a ditching exit.

One commentator suggested that in a case where a high wing airplane sinks to wing level, egress through a Type III size overhead hatch is much more difficult than through a Type I or Type II size opening. In this connection, however, the FAA is not aware of any unsatisfactory service experience with the present requirements. Furthermore, it would appear that requirements for overhead Type I or Type II size hatches would impose difficult if not impossible design limitations in small airplanes. Although the FAA finds no basis for amending requirements as to the size of overhead hatches, the FAA believes that in the light of increasing fuselage sizes, the implicit requirement of accessibility should be clarified. Section 25.807(d) is, therefore, amended to require readily accessible overhead hatches.

Section 25.809. In accordance with recommendations received in response to the notice, proposed Sec. 25.809(f) has been revised to provide for assist means that are erected by means other than by inflation. However, for lack of supporting data to justify such a change, the requirement that the assisting means must be automatically erected has not been deleted as requested by some commentators. The proposal set forth in Sec. 25.809(h) has been changed to make it clear that an assist means must be provided if the trailing edge of the flaps is more than 6 feet above the ground or if the wing is more than 6 feet above the ground and the flaps are unsuitable as a slide. A suggestion was made that the slide specified in Sec. 25.809 should be referred to as "rigid type" slide. This suggestion has not been adopted since requiring a "rigid type" slide could be construed as requiring a device that is not collapsible.

Section 25.811. With respect to requirements of Sec. 25.811 concerning emergency exit markings, some comments indicated that strobe lights should be installed to assist in locating exits. Other comments pointed out the disadvantages associated with the use of strobe lights and suggested a thorough check of such lights prior to any implementation for use with emergency exits. The FAA believes that a mandatory requirement for strobe lights would be premature. However, the FAA believes that perhaps strobe light designs could be devised for complying with the requirement in Sec. 25.811(c) under conditions of dense smoke. Each such design would have to be thoroughly evaluated during the type certification of the airplane.

Comments were also received suggesting the use of signs incorporating arrows as emergency exit markings, and suggesting that exit signs at overwing exits shouldn't be located at that portion of the window that would be removed in the case of an emergency. In this connection, it should be noted that both the current regulations and those set forth in his regulation permit the use of signs incorporating arrows. Moreover, Sec. 25.811 as amended herein requires that exit signs be next to or above each passenger emergency exit. A suggested change to require that emergency exit instructions be painted on a transparent panel or glass panel backed by a panel illuminated to a brightness level of 3 to 4 foot-lamberts, has not been adopted. While this suggestion could be incorporated by any manufacturer, the commentator has presented no supporting data to justify such a change in the regulations and the FAA does not consider that such a requirement is necessary as a minimum standard.

Objections were received concerning the proposed change to the color contrast requirements of current Sec. 25.811(h). In this regard, the comments suggested that the time between the effective date of the current rule and Notice 66-26 was not sufficient to permit the necessary evaluation of the effectiveness of the current requirement. The FAA does not agree with this comment. Experience has shown that when the color reflectance is of a low value, it is possible to get a 3 to 1 ratio as currently prescribed and still not have adequate visual contrast between the colors.

Section 25.812. With respect to the requirements of proposed Sec. 25.812, paragraph (b) has been revised in response to a comment, to make it clear that exit locating signs that are self-illuminated by other than electrical means as well as signs that are internally electrically illuminated may be used in meeting the requirements of that paragraph.

A suggestion was made that the emergency lighting requirements are unrealistic for small business jet aircraft and that aircraft certificated to carry 10 passengers or less should be exempt from certain requirements of Sec. 25.812. The FAA does not agree with this comment. The emergency exit location and identification requirements are particularly important for the small business jets used as executive airplanes since the applicable operating rules do not require crew training in emergency evacuation procedures or a flight attendant or passenger briefing to assist in the evacuation of the passengers of such an airplane.

In response to comments objecting to the requirement for a brightness of at least 50 foot-lamberts, the FAA has decided to retain the current requirement for a brightness of 160 microlamberts. The FAA agrees that the matter of the brightness level for emergency exits requires further investigation before attempting to revise the present requirement.

In addition to the foregoing, the requirements set forth in proposed paragraphs (c) and (d) of Sec. 25.812, have, for purposes of clarification, been incorporated into paragraph (b) of Sec. 25.812.

Proposed paragraph (e) of Sec. 25.812 has been redesignated as paragraph (c) and revised to read substantially the same as the present requirement in Sec. 25.811(f), the only change being a definition of the main passenger aisle.

In response to comments, the requirement for at least 2 foot-candles illumination in proposed paragraph (f) (now paragraph (d) has been deleted.

With respect to the proposed paragraph (g) of Sec. 25.812 (now paragraph (e)), comments objected to the requirement for a cabin switch for the emergency lighting system as being unnecessary. In addition, it was believed that under such a proposal, inadvertent operation of the switch is possible and might be unavoidable. The FAA believes that for airplanes having flight attendants the switch in the passenger cabin serves a necessary function in the event that the flight crew forgot to arm, or inadvertently disarmed, the emergency lighting system. The possibility that the passenger cabin switch might be misused is minimized by the requirement for a means to prevent inadvertent operation of the manual controls. The proposal has been changed to require a switch in the passenger cabin where such a switch is required by the operating rules. The rule has been clarified to provide for arming or turning on rather than switching on.

In paragraph (h) of Sec. 25.812, the FAA proposed to require that exterior emergency lighting be provided at each overwing exit to illuminate the adjacent wing surface and the escape route

from that exit. In addition, under paragraph (i), the FAA proposed to require that the means used to assist the occupants of an airplane in descending to the ground from overwing and non-overwing exits must be illuminated. Several commentators objected on the grounds that there was no indication as to the illumination level that would be required to meet these rules. Subsequent to the issuance of Notice 66- 26, however, the SAE Committee A-20 conducted a series of lighting tests on the basis of which they recommended various emergency lighting intensities wherever exterior emergency lighting is required. These recommended illumination values have been generally accepted by the various segments of the industry and the FAA finds that the recommended illumination intensities provide an adequate level of illumination for the purpose of proposed paragraphs (h) and (i). For these reasons, and since the incorporation of the various levels of illumination into the regulation serves to clarify the requirement, the FAA considers it appropriate to change the proposal accordingly. In addition, the requirement that the escape route must be indicated by a white slip resistant surface has been changed to delete the color requirement and as revised, relocated in Sec. 25.803(e). The requirement for automatic operation of the lights when the exit is opened has also been deleted. The proposed paragraphs (h) and (i) have been redesignated as paragraphs (f) and (g),

For the reasons set forth earlier in this preamble, the effective date of the requirements of paragraphs (f) and (g) of Sec. 25.812, have been postponed for 18 months.

Numerous comments were received requesting clarification of the requirement proposed in Sec. 25.812(i) for illumination of the means used to assist occupants in descending to the ground. In this connection, it was pointed out that the rule should permit the use of self-illuminated slides and should specify the amount of tape or ropes used as assist means that must be actually illuminated. The FAA agrees with the need for clarification and has changed the proposal to prescribe that the assist means must be externally illuminated or self-illuminated so that the deployed assist means is visible from the airplane. However, the FAA does not consider that it is necessary to require a specific light intensity on the assist means as long as it is visible from the airplane.

The requirements set forth in proposed paragraph (j) of Sec. 25.812 (now paragraph (h)) have been revised to state a more realistic power requirement for emergency lights. In this connection, in response to various comments, the proposal has been amended to require that the energy supply provide the required level of illumination for at least 10 minutes at the critical ambient conditions after emergency landing.

Finally, there were various objections to the proposed paragraph (m) of Sec. 25.812 (now paragraph (k)). The comments contend that as proposed, each light would require a separate power source and would impose penalties in terms of weight, cost, and complexity that would overshadow the benefits. The comments stated that a zone concept is employed in aircraft which should assure that a portion of the cabin lighting will remain operative following fuselage breakup. Moreover, they state that for larger airplanes it may be desirable if not imperative to have one battery serve a number of lights which are located in the general area of the battery and suggest the number of lights which might be lost due to crash damage should be in the order of 25 percent.

Upon reconsideration the FAA agrees that insofar as the proposal would have required that only those lights directly damaged by the fuselage breakup could be inoperative following the breakup, it stated an unnecessarily burdensome requirement. The FAA has subsequently determined through analysis that the zone concept for emergency lighting design is acceptable. However, the FAA recognized that in the case of aircraft utilizing the zone concept, lights in addition to those damaged by the fuselage breakup would be rendered inoperative by that breakup. On this basis, the FAA has revised the proposal to allow a light system in which up to 25 percent of the emergency lights, in addition to those directly damaged by the fuselage breakup, could be rendered inoperative after any single vertical separation of the fuselage. However, the revised requirement now states that the system must be so designed that certain important interior lights and certain exterior lights will remain operative after fuselage breakup.

Section 25.813. The FAA does not agree with the recommendation that the width of the passageway to Type II exits should be reduced or that the rule should permit certain obstructions.

The current rules prescribe a 20-inch passageway and numerous evacuation demonstrations indicate that with all factors taken into consideration the 20-inch width is the minimum that can be accepted.

Comments took exception to the proposed Sec. 25.813(c), contending that only the outboard seat need be limited as to seatback position insofar as obstruction to exits is concerned. Other comments stressed the increased accessibility of exits in smaller transports having a single seat on both sides of one aisle, and suggested that a different standard be made applicable to these. In the light of these comments, the FAA has reconsidered Sec. 25.813(c) and agrees that the proposal should be revised to require that the projected exit opening not be obstructed by the seatback of the seat in the outboard position. The "projected exit opening" referred to above and in the notice is the actual, rather than the minimum required opening and the paragraph has been further amended to make this clear. Moreover, the FAA agrees that less stringent requirements are appropriate for the smaller transport category airplanes and the proposal has been changed to retain the language of the current rule for airplanes having maximum passenger seating capacity of 19 or less, to allow minor obstructions if compensatory factors are available to maintain the effectiveness of the exit.

No comments were received with respect to proposed Sec. 25.815 and that section is adopted as proposed in the notice.

Several comments pointed out an ambiguity in proposed Secs. 25.817 governing the number of seats abreast in airplanes having a single passenger aisle. It was the intent of the section to limit to three the number of seats in any one row on each side of the aisle. The section has been amended to make this clear.

Section 25.853. The notice proposed to require that all compartment interior materials under Sec. 25.853, without exception, meet certain self-extinguishing criteria, involving short flame times and burn lengths after removal of the ignition source. Many comments from industry have shown that materials that will meet these criteria are not commercially available at present in quantities suitable for aircraft production or with characteristics compatible with the production of aircraft. These comments have shown that the best available materials for interior wall panels, interior ceiling panels, structural flooring, baggage racks, partitions, draperies, thermal insulation, and coated fabric insulation covering can be made self-extinguishing within average char lengths of 8 inches when tested vertically and 4 inches when tested horizontally, under established test conditions. These comments also have shown that "flame resistance" is an adequate standard for other materials, such as floor coverings, upholstery and its covering, webbing, transparencies, window shades, thermoplastic trim, seat cushion foam, furnishing, and seals. The proposed standards have been amended accordingly in Sec. 25.853(a) and (b).

One commentator noted that the proposed test procedures of Section 25.853 were appropriate only for cloth materials and asked for clarification with respect to glazing materials. Another commentator submitted an alternate test procedure as equivalent to the procedure proposed. In the light of these comments the FAA has reviewed the proposal and agrees that the test criteria should extend to other materials. Furthermore, with some modification, the recommended test procedure is suitable for all materials. Accordingly, Part 25 has been amended by adding a new Appendix F containing an acceptable test procedure for showing compliance with section 25.853. Section 25.853 has been amended to allow the use of this test procedure as an alternative to that proposed in the notice.

Several comments urged upgrading of the standards, maximum use of materials such as glass fiber products, and development of materials that minimize the production of noxious smoke and gas when burned. The FAA agrees that continual upgrading of the standards for fire protection of compartment interior is necessary to make the maximum possible use of the best interior materials as they become commercially available and to encourage the development of such materials. To this end, the standards in amended Sec. 25.853(a) and (b) are believed to represent the most advanced technology now available in this design area.

Section 25.855. The notice proposed to amend Sec. 25.855(a) to require that all cargo and baggage compartment materials must meet the test criteria in proposed Sec. 25.853(a). As discussed above, those proposed test criteria have been altered to reflect the current state of the

art in interior materials design. As further stated above, "flame resistant" is the standard now commercially feasible for the materials used in certain applications as covered in Sec. 25.853(b). Therefore, Sec. 25.855(a) as amended requires that the materials used in the baggage and cargo compartments at least meet the requirement of either paragraph (a) or (b) of Sec. 25.853, depending upon the application of the materials.

Section 25.993. The notice proposed to add a new Sec. 25.933(f) providing that each fuel line within the fuselage must be designed and installed to allow a reasonable degree of deformation and stretching without failure or leakage, and must be enclosed in a shroud.

Several comments concerned the requirement for a shroud. However, this amendment omits such a requirement since a shroud is a device that protects against the effects of leakage rather than a device that prevents leakage. Leakage prevention is the object of this amendment. The need for a shroud should be determined, in each case, under the flammable fluid fire protection requirements of Sec. 25.863.

One comment suggested that the proposal should be applied only to fuel lines within occupied and cargo compartments. Another comment suggested that the proposal should apply only to lines within the pressurized section of the fuselage. These comments are not accepted since fuel lines passing from the fuel tanks through any portion of the fuselage to the engines should be evaluated for leakage security.

This amendment specifies only "leakage" rather than "failure or leakage". Failures other than those that cause leakage, such as those that cause fuel stoppage only, are not the subject of this amendment.

Section 25.1359. The notice proposed to add a new Section 25.1359(c) to require that electrical cables must be isolated from flammable fluid lines and must be shrouded in insulated, flexible conduit to allow a reasonable degree of deformation and stretching without failure.

One comment suggested further limitation of the proposal to main power leads only, stating that the shroud should be separate from the usual insulating cover, and stating that the proposal should apply only to cables in the vicinity of flammable fluid lines. Limitation to main power cables, including generator cables, expresses the intent of the notice and is adopted. Limitation to cables in the vicinity of flammable fluid lines is not necessary in addition to the isolation requirement since a cable not in the vicinity of a fuel line would meet the isolation condition.

One comment suggested that the cable shrouds should be in addition to the normal insulation cover and separate from the cable itself. This characteristic is a part of any main cable now used in aircraft, and was within the intent of the notice. However, this suggestion may result in clarification and is therefore accepted.

PART 37

The notice proposed to amend Sec. 37.132, Safety Belts, TSO-C22e, Sec. 37.136, Aircraft Seats, and Berths, TSO- C39, and Sec. 37.178, Individual Flotation Devices, TSO-C72a to require compliance with test criteria in proposed Sec. 25.853(a). All of the articles covered in these TSO's incorporate materials now covered by Sec. 25.853(b). Since the standard and test procedure now applicable to materials covered by Sec. 25.853(b) are the same as that currently applicable to the materials used in the manufacture of the articles under the referenced TSO's, it is not necessary to cross reference Sec. 25.853 in the TSO's and the proposal is withdrawn.

Section 37.175. The notice proposed to amend Sec. 37.175, Emergency Evacuation Slides, TSO-C69, to require that new models of such equipment must be able to be fully inflated in not more than 10 seconds after activation of the inflation means. One comment suggested that full inflation within the prescribed time limit is not essential if the slide can serve its evacuation function when less than fully inflated and suggested that the regulation should not require full inflation. While the FAA is aware that a slide may be capable of receiving an evacuee prior to the 10 seconds time limit specified in the proposal, the requirement for full inflation in 10 seconds is a design requirement considered by the FAA as necessary to ensure that the slide will provide its maximum support capability within an established period. Moreover, this regulation would not

prohibit the use of a slide prior to the time it became fully inflated. The proposal has not, therefore, been changed as suggested.

In accordance with the proposal, the Applicability provision in Sec. 37.175 has been amended to state that new models of slides manufactured after the effective date of this amendment must be designed so as to be fully inflated in not more than 10 seconds after activation of the inflation means.

PART 121

General. As discussed in the beginning of this preamble, substantive changes have been made in some amendments which, for the most part, have a postponed applicability date. As previously indicated, interested persons may submit comments on these changes.

Due to the length of time that will be necessary for the extensive retrofitting required by these amendments and the time that has passed since publication of the notice, most of the applicable dates of the new equipment provisions have been extended to October 1, 1969.

Certain existing provisions in Part 121 have been deleted since they are no longer applicable. These are Secs. 121.309(f), (g), and (h) and Sec. 121.319. In addition, the provisions of Sec. 121.310(h) have been transferred to Sec. 121.309(f). Appendix D to Part 121 has been reorganized and clarified in line with existing FAA interpretations. The applicability dates in the various paragraphs of Sec. 121.310 have been deleted and, where appropriate under these amendments, new dates have been added.

Section 121.291. *Demonstration of emergency evacuation procedures:* The comments generally agreed with the proposed reduction of time to 90 seconds that will be possible with the new equipment required by these amendments. As provided in the notice, this section will not require redemonstration, except under the stated conditions, by operators who have already met the 2-minute minimum. Due to some confusion over the meaning of the term "previously approved" in Sec. 121.291(a)(2), this section has been changed to make it clear that the 5-percent increase is determined from the passenger seating capacity for which a successful demonstration has been conducted.

The preamble to the notice stated that demonstrations to meet the 90-second maximum would not be required except in one of the three situations set forth in this section. However, the notice did propose to require a demonstration meeting the 90-second maximum in those three situations even though the new equipment upon which the reduction was predicated was not required to be installed for 2 years. The FAA has determined that this demonstration requirement could prove to be an undue burden on a certificate holder initially introducing an airplane type certificated under rules that did not prescribe this new equipment. Consequently, until the new equipment is required, the 2-minute maximum is retained for airplanes that are being initially introduced without such equipment.

Section 121.310(a). *Means for emergency evacuation.* The comments on this section suggested that "inflatable" slides may not be feasible on some airplanes. Therefore, Sec. 25.809(f)(1) has been changed to require that the slides be "erectable" rather than "inflatable". Since it was also indicated that it would take several years to install these slides and that the automatic deployment feature has not been developed for some types of floor level exits, the applicable date of this paragraph has been extended to October 1, 1969.

Section 121.310(d). *Interior emergency light operation.* It was not intended that the interior emergency light be actually turned on during taxiing, takeoff, and landing, but only that they be activated to the extent that they will become lighted as soon as the airplane's normal electrical power is interrupted. The requirement has been clarified in this respect and has otherwise been modified as previously discussed under Sec. 25.812(e).

Section 121.310(f)(3). *Emergency exit access.* As proposed in the notice, the provisions allowing minor obstructions have been deleted except (as discussed under Sec. 25.813(c) above, a provision has been added to prohibit obstruction of the projected exit opening by outboard seat backs adjacent to Type III and Type IV exits. Although this latter requirement was not specifically detailed in the notice, the FAA believes that it is in the interest of safety that it be adopted now. Since a compliance date has been established 1 year after the effective date of this amendment,

interested persons may (as indicated previously in this preamble) submit comments on these provisions to the FAA.

Section 121.310(g). *Exterior exit markings*. The change in this paragraph was proposed because the present requirement for a reflectance ratio of 3:1 has not proven practical, particularly with respect to colors of very low reflectance. Two comments noted that the present regulation has been effective for only a short time and questioned the propriety of changes at this time. However, the necessity for the proposed revisions is readily apparent. A darker color with a reflectance of 5 percent required a lighter color with a reflectance of only 15 percent. This 10 percent difference does not provide adequate visual contrast. However, at a reflectance of 30 percent for the darker color, the lighter color is required to have a reflectance of 90 percent, which is more than is necessary for adequate visual contrast. For these reasons, the proposal is adopted without substantive change. Since this requirement need only be complied with by October 1, 1969, or when the markings are repainted, whichever occurs first, it does not present an unreasonable burden.

Section 121.310(h). *Exterior emergency lighting and escape routes*. This section incorporates Sec. 25.812(f) which has been rewritten from the proposal in the notice. A discussion of the changes is contained in the portion of the preamble on this section. Since the provisions on the slip resistant escape route have been transferred to Sec. 25.803(e), this section is also incorporated.

Section 121.310(i). *Other floor level exits*. This paragraph was presented as paragraph (k) in the notice and is adopted without substantive change.

Section 121.310(j). *Additional emergency exits*. The objective of this provision was to assure that all installed and approved emergency exits, irrespective of whether they were in excess of the required number, would be fully equipped and available for use in an emergency evacuation. However, it was pointed out in the comments that this would tend to penalize operators who provided extra exits since it could cause removal of some passenger seats. To avoid this problem while still maintaining the efficacy of these exits, it has been decided that instead of meeting the specific access requirements of Sec. 121.310(f) (1), (2) and (3), they must be readily accessible to the passengers in addition to meeting the other provisions of this section.

Section 121.311 (c) and (d). *Sideward facing seats and placing of seat backs in the upright position*. The proposal relating to sideward facing seats is adopted with two minor changes in the Part 25 provisions that is incorporated by reference in this paragraph. The alternative of a shoulder harness is added and the term "cushioned" is changed to "energy absorbing" to allow more flexibility in the type of protection that must be provided.

As proposed in the notice, the requirement that during taxiing, takeoff, and landing each seatback must be in the upright position was addressed to seatbacks affecting access to Type III and Type IV exits. The FAA now believes that notwithstanding the limited scope of the proposal in the notice, it is essential for the safety of passengers in a crash situation that during taxiing, takeoff, and landing, each passenger seatback in the airplane must be in the upright position. In adopting this requirement a provision specifically requiring passengers to comply with appropriate crewmember instructions has been included.

Section 121.312. *Materials for compartment interiors*. The notice proposed to add a new requirement that after June 30, 1968, all replacement materials used in passenger or crew compartments would have to meet the new requirements proposed for Sec. 25.853. As discussed above, the proposed requirements for Sec. 25.853 have been revised in this amendment. In addition, several comments pointed out that the replacement requirement as proposed for Part 121 could necessitate impractical and sometimes useless patching with new materials when making small repairs to existing cabin interiors. Since FAA's intent was to require the complete upgrading of existing cabin interiors, the rule as adopted (Sec. 121.312) requires that after October 24, 1968, upon the first major overhaul of an aircraft cabin or refurbishing of the cabin interior there must be a complete replacement of all material with materials that meet Sec. 25.853. In addition, the FAA will survey certificate holders to determine when the requirements of Sec. 25.853 would be met for each airplane in their fleets. If the results of this survey indicate that this phased replacement program will not accomplish the desired upgrading of cabin interiors

within a reasonable period of time, the FAA will consider separate rule making action to establish a specific cutoff date for accomplishing such replacement.

Section 121.391. *Flight attendants*. After considering all of comments submitted the FAA has decided to retain the limited deviation authority presently in Sec. 121.391(b) rather than the one proposed in the notice. However, the additional limitations proposed in the notice prohibiting any operation with fewer flight attendants than the number used in emergency evacuation demonstrations under Sec. 121.291 is being retained

Section 121.571(b). *Passenger briefing cards*. Several comments were of the opinion that distributing cards to each passenger was impractical and would add very little to the oral briefing. There is also an FAA study in progress to determine better methods of informing passengers on emergency exits. In view of these facts, the requirement for distributing the briefing cards has been deleted from this amendment.

Section 121.589. *Carry-on baggage*. The provisions of this new section have been revised and clarified to permit more effective enforcement. The prohibition against carrying articles of baggage aboard that could slide out from under seats in the event of a crash has been postponed in order to allow installation of a means of securing them. One comment indicated that it would take several years to equip all existing seats in this manner. However, the FAA believes that such an installation will be relatively simple and can be accomplished in much shorter period of time.

Appendix D. The changes proposed in the notice and other existing FAA interpretations (see for example item 20) are incorporated in paragraph (a) and, in addition, the paragraph is reorganized and reworded for greater clarity.

Interested persons have been afforded an opportunity to participate in the making of this amendment, and due consideration has been given to all matter presented.

(Secs. 313(a), 601, 603, and 604 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, and 1424))

Adoption of the Amendments:

In consideration of the foregoing, Parts 21, 25, 37, and 121 of the Federal Aviation Regulations are amended effective October 24, 1967, as follows:

1. Section 21.17(a) is amended to read as follows:

Sec. 21.17 Designation of applicable regulations.

(a) Except as provided in Sec. 25.2 of this chapter, an applicant for a type certificate (other than for restricted category, import, or surplus military aircraft) must show that the aircraft, aircraft engine, or propeller concerned meets the applicable requirements of this subchapter that are effective on the date of application for that certificate, unless--

- (1) Otherwise specified by the Administrator; or
- (2) Compliance with later effective amendments is elected or required under this section.

* * * * *

2. The introductory statement in Sec. 21.101(a) is amended to read as follows:

Sec. 21.101 Designation of applicable regulations.

(a) Except as provided in Sec. 25.2 of this chapter, an applicant for a change to type certificate must comply with either--

- (1) The regulations incorporated by reference in the type certificate; or
- (2) The applicable regulations in effect on the date of the application, plus any other amendments the Administrator finds to be directly related.

* * * * *

3. A new Sec. 25.2 is added after Sec. 25.1 to read as follows:

Sec. 25.2 Special retroactive requirements.

Notwithstanding Secs. 21.17 and 21.101 of this chapter and irrespective of the date of applicant, each applicant for a type certificate and each applicant for a supplemental-type certificate (or an amendment to a type certificate) involving an increase in passenger seating capacity to a total greater than that for which the airplane has been type certificated, must show:

- (a) After October 23, 1967, that the airplane concerned meets the requirements of Secs. 25.783(g), 25.785(c), 25.803(b), (c), and (d), 25.807(a), 25.807(c), 25.807(d), 25.809(f) and (h), 25.811(a), (b), (d), (e), (f), and (g), 25.812(a)(1), (b), (c), (d), (e), (h), (i), (j), (k)(1), (k)(2), 25.813(a), (b), and (c), 25.815, 25.817, 25.853 (a) and (b), 25.855(a), 25.993(f), and 25.1359(c) in effect on October 24, 1967, and
- (b) After April 24, 1969, that the airplane concerned meets the requirements of Secs. 25.721(d), 25.803(e), 25.811(c), 25.812(a)(2), (b), (g), and (k)(3) in effect on October 24, 1967.

4. Section 25.721 is amended by adding a new paragraph (d) to read as follows:

Section 25.721 General.

(d) The main landing gear system must be designed so that if it fails due to overloads during takeoff and landing (assuming the overloads are in the vertical plane parallel to the longitudinal axis of the airplane), the failure mode is not likely to puncture any part of the fuel system in the fuselage.

5. Section 25.783 is amended by adding a new paragraph (g) to read as follows:

Sec. 25.783 Doors.

(g) Each passenger entry door in the side of the fuselage must qualify as a Type A, Type I, or Type II passenger emergency exit and must meet the requirements of Secs. 25.807 through 25.813 that apply to that type of passenger emergency exit. If an integral stair is installed at such a passenger entry door, the stair must be designed so that when subjected to the inertia forces specified in Sec. 25.561, and following the collapse of one or more legs of the landing gear, it will not interfere to an extent that will reduce the effectiveness of emergency egress through the passenger entry door.

6. Section 25.785 (c) is amended to read as follows:

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

(c) Each occupant of a sideward facing seat must be protected from head injury by a safety belt and an energy absorbing rest that will support the arms, shoulders, head, and spine, or by a safety belt and a shoulder harness that will prevent the head from contacting any injurious object. Each occupant of any other seat must be protected from head injury by--

- (1) A safety belt and shoulder harness that will prevent the head from contacting any injurious object;
- (2) A safety belt plus the elimination of any injurious object within striking radius of the head; or
- (3) A safety belt and an energy absorbing rest that will support the arms, shoulders, head, and spine.

7. Section 25.803 is amended by amending paragraph (b) and by adding new paragraphs (c), (d), and (e) as follows:

Sec. 25.803 Emergency evacuation.

* * * * *

(b) Passenger ventral and tail cone, crew access, and service doors may be considered as emergency exits if they meet the applicable requirements of this section and Secs. 25.805 through 25.813.

(c) Except as provided in paragraph (d) of this section, on airplanes having a seating capacity of more than 44 passengers, it must be shown by actual demonstration that the maximum seating capacity, including the number of crewmembers required by the operating rules, for which certification is requested can be evacuated from the airplane to the ground within 90 seconds. Evacuees using stands or ramps allowed by subparagraph (8) of this paragraph are considered to be on the ground when they are on the stand or ramp, provided that the acceptance rate of the stand or ramp is no greater than the acceptance rate of the means available on the airplane for descent from the wing during an actual crash situation. The demonstration must be conducted under the following conditions:

(1) It must be conducted either during the dark of the night or during daylight with the dark of the night simulated, utilizing only the emergency lighting system and utilizing only the emergency exits and emergency evacuation equipment on one side of the fuselage, with the airplane in the normal ground attitude, with landing gear extended.

(2) All emergency equipment must be installed in accordance with specified limitations of the equipment.

(3) Each external door and exit, and each internal door and curtain must be in a configuration to simulate a normal takeoff.

(4) Seat belts and shoulder harnesses (as required) must be fastened.

(5) A representative passenger load of persons in normal health must be used as follows:

(i) At least 30 percent must be female.

(ii) Approximately 5 percent must be over 60 years of age, with a proportionate number of females.

(iii) At least 5 percent but no more than 10 percent must be children under 12 years of age, prorated through that age group.

(6) Persons who have knowledge of the operation of the exits and emergency equipment may be used to represent an air carrier crew. Such representative crewmembers must be in their seats assigned for takeoff and landing and none may be seated next to an emergency exit unless that seat is his assigned seat for takeoff. They must remain in their assigned seats until receiving the signal for the beginning of the demonstration.

(7) There can be no practice or rehearsal of the demonstration for the passengers except that they may be briefed as to the location of all emergency exits before the demonstration. However, no indication may be given of the particular exits to be used in the demonstration.

(8) Stands or ramps may be used for descent from the wing to the ground.

(9) All evacuees other than those using an overwing exit must leave the airplane by the means provided as part of the airplane's equipment.

(d) The emergency evacuation demonstration need not be repeated after a change in the interior arrangement of the airplane or an increase of not more than 5 percent in passenger seating capacity over that previously approved by actual demonstration, or both, if it can be substantiated by analysis, taking due account of the differences, that all the passengers for which the airplane is certificated can evacuate within 90 seconds.

(e) An escape route must be established from each overwing emergency exit, marked and (except for flap surfaces suitable as slides) covered with a slip resistant surface.

8. Section 25.807(a) is amended to read as follows:

Sec. 25.807 Passenger emergency exits.

(a) *Type and location.* For the purpose of this part, the types and locations of exits are as follows:

(1) *Type I*. This type must have a rectangular opening of not less than 24 inches wide by 48 inches high, with corner radii not greater than one-third the width of the exit. Type I exits must be floor level exits.

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

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

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

(5) *Ventral*. This type is an exit from the passenger compartment through the pressure shell and the bottom fuselage skin. The dimensions and physical configuration of this type of exit must allow at least the same rate of egress as a Type I with the airplane in the normal ground attitude, with landing gear extended.

(6) *Tail cone*. This type is an aft exit from the passenger compartment through the pressure shell and through an openable cone of the fuselage aft of the pressure shell. The means of opening the tail cone must be simple and obvious, and must employ a single operation.

(7) *Type A*. An emergency exit may be designated as a Type A exit if the following criteria are met:

(i) There must be a rectangular opening not less than 42 inches wide by 72 inches high, with corner radii not greater than one-sixth of the width of the exit.

(ii) It must be a floor level exit.

(iii) Unless there are two or more main (fore and aft) aisles, the exit must be located so that there is passenger flow along the main aisle to that exit from both the forward and aft direction.

(iv) There must be an unobstructed passageway at least 36 inches wide leading from each exit to the nearest main aisle.

(v) 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 a cross aisle leading directly to each passageway between the exit and the nearest main aisle.

(vi) There must be at least one seat adjacent to each such exit that could be occupied by a flight attendant.

(vii) Adequate assist space next to each Type A exit must be provided at each side of the passageway, to allow the crewmember(s) to assist in the evacuation of passengers without reducing the unobstructed width of the passageway below that required by subdivision (iv) of this subparagraph.

(viii) At each non-over-wing exit there must be installed a slide capable of carrying simultaneously two parallel lines of evacuees.

(ix) Each overwing exit having a stepdown must have an assist means 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 and self-supporting within 10 seconds. Stepdown distance as used in this section means the actual distance between the bottom of the required opening and a usable foothold, extending out from the fuselage, that is large enough to be effective without searching by sight or feel.

* * * * *

9. Section 25.807(c) is amended to read as follows:

(c) *Passenger emergency exits*. The prescribed exits need not be diametrically opposite each other nor identical in size and location on both sides. They must be distributed as uniformly as

practicable taking into account passenger distribution. The first floor level exit on each side of the fuselage must be in the rearward part of the passenger compartment unless another location affords a more effective means of passenger evacuation. Where more than one floor level exit per side is prescribed, at least one floor level exit per side must be located near each end of the cabin, except that this provision does not apply to combination cargo/passenger configurations. Exits must be provided as follows:

(1) Except as provided in subparagraphs (2) through (8) of this paragraph, the number and type of passenger emergency exits must be in accordance with the following table:

Emergency exits for each side of the fuselage				
Passenger seating capacity (cabin attendants not included)	Type I	Type II	Type III	Type IV
1 through 10	--	--	--	1
11 through 19	--	--	1	--
20 through 39	--	1	--	1
40 through 59	1	--	--	1
60 through 79	1	--	1	--
80 through 109	1	--	1	1
110 through 139	2	--	1	--
140 through 179	2	--	2	--

(2) Two Type IV exits may be installed instead of each required Type III exit prescribed in subparagraph (1) of this paragraph.

(3) If slides meeting the requirements of Sec. 25.809(f)(1) are installed at floor level exits (other than overwing exits), the passenger/emergency exit relationship specified in subparagraph (1) of this paragraph may be increased by--

(i) Not more than five passengers on airplanes with at least two of these exits; and

(ii) Not more than 10 passengers on airplanes with at least four of these exits. However, no increase in passenger seating capacity is allowed under this subparagraph if an increase in passenger seating capacity is obtained under subparagraph (4) of this paragraph.

(4) An increase in passenger seating capacity above the maximum permitted under subparagraph (1) of this paragraph but not to exceed a total of 299 may be allowed in accordance with the following table for each additional pair of emergency exits in excess of the minimum number prescribed in subparagraph (1) of this paragraph for 179 passengers:

Additional emergency exits (each side of fuselage)	Increase in passenger seating capacity allowed
Type A	100
Type I	45
Type II	40
Type III	35

(5) For passenger capacities in excess of 299, each emergency exit in the side of the fuselage must be either a Type A or a Type I. A passenger seating capacity of 100 is allowed for each pair of Type A exits and a passenger seating capacity of 45 is allowed for each pair of Type I exits.

(6) If a passenger ventral or tail cone exit is installed and can be shown to allow a rate of egress at least equivalent to that of Type III exit with the airplane in the most adverse exit opening

condition because of the collapse of one or more legs of the landing gear, an increase in passenger seating capacity beyond the limits specified in subparagraph (1), (4), or (5) of this paragraph may be allowed as follows:

- (i) For a ventral exit, 12 additional passengers.
 - (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 one-third the width of the exit, in the pressure shell and incorporating an approved assist means in accordance with Sec. 25.809(f)(1), 25 additional passengers; or
 - (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 passengers.
- (7) For airplanes on which the vertical location of the wing does not allow the installation of overwing exits, an exit of at least the dimensions of a Type III must be installed instead of each Type III and each Type IV exit required by subparagraph (1) of this paragraph.
- (8) Each emergency exit in the passenger compartment in excess of the minimum number of required emergency exits must meet the applicable requirements of Secs. 25.809 through 25.812, and must be readily accessible.

10. Section 25.807(d) is amended to read as follows:

(d) *Ditching emergency exits for passengers.* If the emergency exits required by paragraph (c) of this section do not meet subparagraphs (1) and (2) of this paragraph, exits must be added to meet them:

- (1) A Type IV exit on each side of the airplane, both above the waterline, with a passenger seating capacity of 10 or less.
- (2) A Type III exit for airplanes with a passenger seating capacity of 11 or more, with at least one emergency exit above the waterline for each unit (or part of a unit) of 35 passengers, but no less than two such exits, with one on each side of the airplane. However, where it has been shown through analysis, ditching demonstrations, or any other tests found necessary by the Administrator, that the evacuation capability of the airplane during ditching is improved by the use of larger exits or by other means, the passenger/exit ratio may be increased.
- (3) If side exits cannot be 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 capacity of 35 or less, the two required Type III side exits need be replaced by only one overhead hatch.
- (4) Two Type IV exits may be installed instead of each required Type III exit.

11. Section 25.809 is amended by amending paragraph (f) and by adding a new paragraph (h) as follows:

Sec. 25.809 Emergency exit arrangement.

* * * * *

(f) Each landplane emergency exit (other than exits located over the wing) 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 as follows:

- (1) The assisting means for each passenger emergency exit must be a self-supporting slide or equivalent, and must be designed so that it is--
 - (i) Automatically deployed, and automatically erected, concurrent with the opening of the exit except that the assisting means may be erected in a different manner when installed at service doors that qualify as emergency exits, and at passenger doors; and
 - (ii) Erectable within 10 seconds and of such length that the lower end is self-supporting on the ground after collapse of any one or more landing gear legs.

(2) The assisting means for flight crew emergency exits may be a rope or any other means demonstrated to be suitable for the purpose. If the assisting means is a rope, or an approved device equivalent to a rope, it must be--

(i) Attached to the fuselage structure at or above the top of the emergency exit opening, or, for a device at a pilot's emergency exit window, at another approved location if the stowed device, or its attachment, would reduce the pilot's view in flight;

(ii) Able (with its attachment) to withstand a 400-pound static load.

* * * * *

(h) If the trailing edge of the flaps in the landing position is more than 6 feet above the ground with the airplane on the ground and the landing gear extended, or if the wing is more than 6 feet above the ground with the landing gear extended and the flaps are unsuitable as a slide, means must be provided to assist evacuees (who have used the overwing exits) to reach the ground.

12. Section 25.811 is amended to read as follows:

Sec. 25.811 Emergency exit marking.

(a) Each passenger emergency exit, its means of access, and its means of opening must be conspicuously marked.

(b) The identity and location of each passenger emergency exit must be recognizable from a distance equal to the width of the cabin.

(c) Means must be provided to assist the occupants in locating the exits in conditions of dense smoke.

(d) The location of each passenger emergency exit must be indicated by a sign visible to occupants approaching along the main passenger aisle. There must be a locating sign--

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

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

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

(e) The location of the operating handle and instructions for opening must be shown--

(1) For each passenger emergency exit, by a marking on or near the exit that is readable from a distance of 30 inches; and

(2) For each Type I or Type II passenger emergency exit with a locking mechanism released by rotary motion of the handle, by--

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

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

(f) Each emergency exit that is required to be openable from the outside, and its means of opening, must be marked on the outside of the airplane. In addition, the following apply:

(1) The outside marking for each passenger emergency exit in the side of the fuselage must include a 2-inch colored band outlining the exit.

(2) Each outside marking including the band, must have color contrast to be readily distinguishable from the surrounding fuselage surface. The contrast must be such that if the reflectance of the darker color is 15 percent or less, the reflectance of the lighter color must be at least 45 percent. "Reflectance" is the ratio of the luminous flux reflected by a body to the luminous flux it receives. When the reflectance of the darker color is greater than 15 percent, at least a 30-percent difference between its reflectance and the reflectance of the lighter color must be provided.

(3) In the case of exits other than those in the side of the fuselage, such as ventral or tail cone exits, the external means of opening, including instructions if applicable, must be conspicuously marked in red, or bright chrome yellow if the background color is such that red is inconspicuous.

When the opening means is located on only one side of the fuselage, a conspicuous marking to that effect must be provided on the other side.

(g) Emergency exits need only be marked with the word "Exit."

13. A new Sec. 25.812 is added to read as follows:

Sec. 25.812 Emergency lighting.

(a) An emergency lighting system, independent of the main lighting system, must be installed which includes:

(1) Illuminated emergency exit marking and locating signs, sources of general cabin illumination, and interior lighting in emergency exit areas.

(2) Exterior emergency lighting.

(b) Each passenger exit sign and each exit locating sign must have white letters at least 1 inch high on a red background at least 2 inches high. These signs may be internally electrically illuminated, or self-illuminated by other than electrical means, with an initial brightness of at least 160 microlamberts. The colors may be reversed in the case of internally electrically illuminated signs if this will increase the illumination of the exit.

(c) General illumination in the passenger cabin must be provided so that when measured along the centerline of main passenger aisles at seat armrest height and at 40-inch intervals, the average illumination is not less than 0.05 foot-candle. A main passenger aisle is considered to extend along the fuselage from the most forward passenger emergency exit or cabin occupant seat, whichever is farther forward, to the most rearward passenger emergency exit or cabin occupant seat, whichever is farther aft.

(d) The floor of the passageway leading to each floor-level passenger emergency exit, between the main aisles and the exit openings, must be provided with illumination.

(e) The emergency lighting system must be designed as follows:

(1) The lights must be operable manually from the flight crew station and (if required by the operating rules of this chapter) from a point in the passenger compartment that is readily accessible to a normal flight attendant seat. Means must be provided to safeguard against inadvertent operation of the manual controls.

(2) When armed or turned on, the lights must remain lighted or become lighted upon interruption (except an interruption caused by a vertical separation of the fuselage during crash landing) of the airplane's normal electric power.

(f) Exterior emergency lighting must be provided at each overwing exit so that the illumination is--

(1) Not less than 0.02 foot-candle (measured on a plane parallel to the surface) on a 2-square-foot area where an evacuee is likely to make his first step outside the cabin;

(2) Not less than 0.05 foot-candle (measured normal to the direction of the incident light) for a minimum width of 2 feet along the 30 percent of the slip-resistant escape route required in Sec. 25.803(e) that is farthest from the exit; and

(3) Not less than 0.02 foot-candle on the ground surface with the landing gear extended (measured on a horizontal plane) where an evacuee using the established escape route would normally make first contact with the ground.

(g) The means required in Sec. 25.809(f)(1) and (h) to assist the occupants in descending to the ground must be illuminated so that the deployed assist means is visible from the airplane.

(1) If the assist means is illuminated by exterior emergency lighting, it must provide--

(i) Illumination at each overwing emergency exit of not less than 0.02 foot-candle on the ground surface with the landing gear extended (measured in a horizontal plane) where an evacuee using the established escape route would normally make first contact with the ground; and

(ii) Illumination at each non-over-wing emergency exit, of not less than 0.03 foot-candle (measured normal to the direction of the incident light) at the ground end of the assist means and, for each non-over-wing exit in the side of the fuselage, over a spherical surface 10° to either side of the center of the assist means and from 30° above to 5° below the 45° position of the assist means.

(2) If the assist means is self-illuminated, the lighting provisions--

- (i) May not be adversely affected by stowage; and
- (ii) Must provide sufficient ground surface illumination so that obstacles at the end of the assist means are clearly visible to evacuees.
- (h) The energy supply to each emergency lighting unit must provide the required level of illumination for at least 10 minutes at the critical ambient conditions after emergency landing.
- (i) If storage batteries are used as the energy supply for the emergency lighting system, they may be recharged from the airplane's main electric power system: *Provided*, That, the charging circuit is designed to preclude inadvertent battery discharge into charging circuit faults.
- (j) Components of the emergency lighting system, including batteries, wiring relays, lamps, and switches must be capable of normal operation after having been subjected to the inertia forces listed in Sec. 25.561(b).
- (k) The emergency lighting system must be designed so that after any single vertical separation of the fuselage during crash landing--
 - (1) Not more than 25 percent of all electrically illuminated emergency lights required by this section are rendered inoperative, in addition to the lights that are directly damaged by the separation;
 - (2) Each electrically illuminated exit sign required under Sec. 25.811(d)(2) remains operative exclusive of those that are directly damaged by the separation; and
 - (3) At least one required exterior emergency exit light for each side of the airplane remains operative exclusive of those that are directly damaged by the separation.

14. Section 25.813 is amended by amending paragraphs (a), (b), and (c) to read as follows:

Sec. 25.813 Emergency exit access.

- (a) There must be a passageway between individual passenger areas, and leading from each aisle to each Type I and Type II emergency exit. These passageways must be unobstructed and at least 20 inches wide.
- (b) For each passenger emergency exit covered by Sec. 25.809(f), there must be enough space next to the exit to allow a crewmember to assist in the evacuation of passengers without reducing the unobstructed width of the passageway below that required for the exit.
- (c) There must be access from each aisle to each Type III or Type IV exit. The access must not be obstructed by seats, berths, or other protrusions which would reduce the effectiveness of the exit. However, for airplanes having a maximum passenger seating capacity not exceeding 19, there may be minor obstructions if there are compensatory factors to maintain the effectiveness of the exit. For airplanes having a maximum seating capacity of 20 or more, the projected opening of the exit provided must not be obstructed by a seatback in any position at the outboard seat locations.

15. Section 25.815 is amended to read as follows:

Sec. 25.815 Width of aisle.

The passenger aisle width at any point between seats must equal or exceed the values in the following table:

Minimum passenger aisle width (inches)		
Passenger seating capacity	Less than 25 inches from floor	25 inches and more from floor
10 or less	12	15
11 through 19	12	20
20 or more	15	20

16. A new Sec. 25.817 is added to read as follows:

Sec. 25.817 Maximum number of seats abreast.

On airplanes having only one passenger aisle, no more than 3 seats abreast may be placed on each side of the aisle in any one row.

17. Paragraphs (a) and (b) of Sec. 25.853 are amended to read as follows:

Sec. 25.853 Compartment interiors.

Materials (including finishes, if applied) used in each compartment occupied by the crew or passengers, must meet the following test criteria, as applicable:

(a) When tested in accordance with the applicable portions of Appendix F of this part or the applicable portions of methods 5902 and 5906, dated May 15, 1951, of Federal Specification CCC-T-191b (which is available from the General Services Administration, Business Service Center, Region 3, Seventh and D Streets S.W., Washington, D.C. 20407), or other approved equivalent method, the interior wall panels, interior ceiling panels, draperies, structural flooring, baggage racks, partitions, thermal insulation, and coated fabric insulation covering must be self-extinguishing after flame removal. All materials used in these applications must be tested vertically. If the material is tested vertically as a fabricated unit, a section of that fabricated unit must also be tested horizontally. The average char length may not exceed 8 inches when the material is tested vertically, and may not exceed 4 inches when the material is tested horizontally. Layered materials may not be separated for the purpose of this test.

(b) When tested horizontally under the applicable portions of Appendix F of this part, or the applicable portions of method 5906, dated May 15, 1951 of Federal Specification CCC-T-191b, or other approved equivalent method, interior materials not specified in paragraph (a) of this section must be at least flame resistant. Layered materials may not be separated for the purpose of this test.

18. Paragraph (a) of Sec. 25.855 is amended to read as follows:

Sec. 25.855 Cargo and baggage compartments.

(a) Each cargo and baggage compartment (including tie down equipment) must be constructed of materials that at least meet the requirements set forth in Sec. 25.853.

* * * * *

19. A new paragraph (f) is added to Sec. 25.993 to read as follows:

Sec. 25.993 Fuel system lines and fittings.

* * * * *

(f) Each fuel line within the fuselage must be designed and installed to allow a reasonable degree of deformation and stretching without leakage.

20. A new paragraph (c) is added to Sec. 25.1359 to read as follows:

Sec. 25.1359 Electrical system fire and smoke protection.

* * * * *

(c) Main power cables (including generator cables) must --

- (1) Be isolated from flammable fluid lines in the fuselage;
- (2) Be shrouded by means of electrically insulated flexible conduit, or equivalent, which is in addition to the normal cable insulation; and
- (3) Be designed to allow a reasonable degree of deformation and stretching without failure.

21. Part 25 is amended by adding a new Appendix F to read as follows:

Appendix F

An Acceptable Test Procedure For Showing Compliance with Sec. 25.853

(a) *Conditioning.* Specimens must be conditioned to 70°F. plus or minus 5° and at 50 percent plus or minus 5 percent relative humidity until moisture equilibrium is reached. Only one specimen at a time may be removed from the conditioned environment immediately before subjecting it to the flame.

(b) *Specimen configuration.* The specimen must be no thicker than the minimum thickness to be qualified for use in the airplane. Rigid and flexible specimens, 4½ inches by 12½ inches, or the actual size used in the airplane must be clamped in a metal frame so that the two long edges and one end are held securely. The frame must be such that the exposed area is at least 2 inches wide and 11½ inches long unless the actual size used in the airplane is smaller. In the case of fabrics, the direction of the weave corresponding to the most critical burn rate must be parallel to the longest dimension.

(c) *Apparatus.* The tests must be conducted in a sheet metal cabinet of appropriate size provided with a door containing a glass insert for observing the burning specimen. The cabinet top must contain a baffled vent. There must be baffled holes or similar means of ventilation near the bottom of the cabinet. Larger panels need not be tested in this apparatus but must be tested in similar draft-free conditions.

(d) *Horizontal test.* A minimum of three specimens must be tested and the results averaged. Each specimen must be supported horizontally. The surface exposed to the air when installed in the aircraft must be face down for the test. The specimen must be ignited by a Bunsen burner or Tirrill burner with a nominal three-eighths inch I.D. tube adjusted to give a flame of 1½ inches in height with the air completely shut off. The specimen must be positioned so that the edge being tested is three-fourths of an inch above the top of, and on the center line of, the burner. The flame must be applied for 15 seconds and then removed. Char length must be noted when testing for compliance with Sec. 25.853(a). To determine burn rate for compliance with Sec. 25.853(b), a minimum of 10 inches of the specimen must be used for timing purposes, approximately 1½ inches must burn before the burning front reaches the timing zone, and the average burn rate must not exceed 4 inches per minute. If, in testing for compliance with Sec. 25.853(b), the specimens do not support combustion after the ignition flame is applied for 15 seconds, or if the flame extinguishes itself and subsequent burning without a flame does not extend into the undamaged areas, the material is also acceptable.

(e) *Vertical test.* A minimum of three specimens must be tested and the results averaged. Each specimen must be supported vertically. Ceiling or floor panels may be tested with any edge down. Rigid specimens of materials mounted vertically in the airplane must be oriented for the test in the same manner as oriented in the airplane. The specimen must be ignited by a Bunsen or Tirrill burner with a nominal three-eighths inch I.D. tube adjusted to give a flame of 1½ inches in height with the air completely shut off. The center line of the burner must be in line with a surface of the material being tested or, in the case of fabricated units, must be in line with the surface exposed to the air in the airplane. The lower edge of the specimen being tested must be

three-fourths inch above the top of the burner. The flame must be applied for 12 seconds and then removed. Char length must be noted.

(f) *Char length.* Char length for fabrics and coated fabrics is the distance from the specimen end that was exposed to the flame to the end of a tear made lengthwise on the specimen through the center of the charred area. The tear must be made as follows: A hook must be inserted in the specimen at one side of the charred areas one-fourth inch from the adjacent outside edge and one-fourth inch in from the charred end of the specimen. A weight of sufficient size such that the weight and hook together equal the total tearing load specified below must be applied gently to the specimen by grasping the corner of the cloth at the opposite edge of the char from the load and raising the specimen and weight clear of the support. The total tearing load for various weights per square yard of test cloth is as follows:

Weight per square yard of test cloth (ounces)	Total tearing load (pounds)
2 to 6	0.25
Over 6 to 15	0.5
Over 15 to 23	0.75
Over 23	1.0

On materials other than fabrics, the char length is the total length of the specimen consumed or charred by burning. The length is measured from the ignition edge to a point that is not punctured by a ballpoint pen (or equivalent) when progressively moved from unburned to burned areas.

Section 37.175 [Amended]

22. Paragraph (a)(1) of Sec. 37.175 is amended by adding a new sentence before the last sentence to read as follows:

"However, new models manufactured on or after October 24, 1967, are required to be designed so as to be fully inflated in not more than 10 seconds after actuation of the inflation means."

23. Section 121.291 is amended to read as follows:

Sec. 121.291 Demonstration of emergency evacuation procedures.

(a) Each certificate holder must show, by actual demonstrations conducted in accordance with paragraphs (a) and (b) of Appendix D to this part, that the emergency evacuation procedures for each type and model of airplane with a seating capacity of more than 44 passengers, that is used in its passenger-carrying operations, allow the evacuation of the full seating capacity, including crewmembers, in 90 seconds or less --

- (1) Upon the initial introduction of a type and model of airplane into passenger-carrying operations;
- (2) Upon increasing by 5 percent or more the passenger seating capacity for which a successful demonstration has been conducted; or
- (3) Upon a major change in the passenger cabin interior configuration that will affect the emergency evacuation of passengers.

However, until October 1, 1969, a certificate holder who is initially introducing a type and model aircraft that does not meet the requirements of Sec. 25.809(f)(1) of this chapter need only accomplish the required demonstrations in 2 minutes or less.

(b) Each certificate holder operating or proposing to operate one or more landplanes in extended overwater operations, or otherwise required to have certain equipment under Sec. 121.339, must show, by a simulated ditching conducted in accordance with paragraph (c) of Appendix D to this part, that it has the ability to efficiently carry out its ditching procedures.

24. Section 121.309 is amended by deleting paragraphs (f), (g), and (h) and by adding a new paragraph (f) to read as follows:

Sec. 121.309 Emergency equipment.

* * * * *

(f) *Megaphones.* Each passenger-carrying airplane must have a portable battery-powered megaphone or megaphones readily accessible to the crewmembers assigned to direct emergency evacuation, installed as follows:

(1) One megaphone on each airplane with a seating capacity of more than 60 and less than 100 passengers, at the most rearward location in the passenger cabin where it would be readily accessible to a normal flight attendant seat.

(2) Two megaphones in the passenger cabin on each airplane with a seating capacity of more than 99 passengers, one installed at the forward end and the other at the most rearward location where it would be readily accessible to a normal flight attendant seat.

25. Section 121.310(a) is amended to read as follows:

Sec. 121.310 Additional emergency equipment.

(a) *Means for emergency evacuation.* Each passenger-carrying landplane emergency exit (other than over-the-wing) that is more than 6 feet from the ground with the airplane on the ground and the landing gear extended, must have an approved means to assist the occupants in descending to the ground. The assisting means for a floor level emergency exit must comply with the following:

(1) Until October 1, 1969, it must be a slide or equivalent approved device suitable for rapid evacuation of passengers. During flight the slide, or equivalent approved device, must be kept readily accessible for immediate installation and use.

(2) After September 30, 1969, it must meet the requirements of Sec. 25.809(f)(1) of this chapter. An assisting means that deploys automatically must be armed during taxiing, takeoffs, and landings. This paragraph does not apply to the rear window emergency exit of DC-3 airplanes operated with less than 36 occupants including crewmembers and less than five exits authorized for passenger use.

* * * * *

26. Section 121.310(b) is amended by deleting the phrase "After September 15, 1966," from the lead sentence, by capitalizing the word which follows that phrase, and by changing the cross-reference in subparagraph (2) to read "Sec. 25.812(b)".

27. Section 121.310(c) is amended by deleting the phrase "After September 15, 1966," from the lead sentence and by capitalizing the word which follows that phrase.

28. Section 121.310(d) is amended to read as follows:

(d) *Interior emergency light operation.* Each light required by paragraph (c) of this section must comply with the following:

(1) Until October 1, 1969, each light must be operable manually, and must operate automatically from the independent lighting system --

(i) In a crash landing; or

(ii) Whenever the airplane's normal electric power to the light is interrupted.

(2) After September 30, 1969, each light must --

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

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

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

Each light must be armed or turned on during taxiing, takeoff, and landing. In showing compliance with this paragraph a vertical separation of the fuselage need not be considered.

29. Section 121.310(e) is amended by deleting the phrase "After June 30, 1966," from the lead sentence and by capitalizing the word which follows that phrase.

30. Section 121.310(f) is amended by deleting the phrase "After June 30, 1966," from the lead sentence, by capitalizing the word which follows that phrase, and by amending subparagraph (3) to read as follows:

(f) *Emergency exit access.* * * *

(3) There must be access from the main aisle to each Type III and Type IV exit. The access from the aisle to these exits must not be obstructed by seats, berths, or other protrusions in a manner that would reduce the effectiveness of the exit. In addition, after October 24, 1968, the access must meet the requirements of Sec. 25.813(c).

31. Section 121.310(g) is amended to read as follows:

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

(1) Until October 1, 1969, unless all the requirements of subparagraph (2) of this paragraph are met, the reflectance of the lighter color must exceed the reflectance of the darker color by a factor of at least three.

(2) After September 30, 1969, or whenever the exterior exit markings on an airplane are repainted, whichever occurs first -

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

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

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

32. Sections 121.310(h) and 121.310(i) are deleted and new Sec. 121.310(h), (i), and (j) are added after Sec. 121.310(g) to read as follows:

(h) *Exterior emergency lighting and escape route.* After September 30, 1969, no person may operate a passenger-carrying airplane unless it is equipped with exterior emergency lighting that meets the requirements of Sec. 25.812(f) of this chapter and a slip resistant escape route that meets the requirements of Sec. 25.803(e) of this chapter.

(i) *Other floor level exits.* After September 30, 1969, no certificate holder may operate a passenger-carrying airplane unless each floor level exit on the airplane meets all the emergency exit requirements of this section. However, the Administrator may grant a deviation from this paragraph for a floor level exit outside the passenger cabin if he finds that special circumstances make compliance impractical and that the proposed deviation provides an equivalent level of safety.

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

33. Section 121.311 is amended by adding new paragraphs (c) and (d) at the end thereof to read as follows:

Sec. 121.311 Seat and safety belts.

* * * * *

(c) After September 30, 1969, each sideward facing seat must comply with the applicable requirements of Sec. 25.785(c) of this chapter.

(d) Except where necessary to comply with Sec. 121.310(f)(3), no person may taxi, takeoff, or land an airplane unless each passenger seat back is in the upright positions. Each passenger shall comply with instructions given by a crewmember in compliance with this paragraph.

34. A new Sec. 121.312 is added to read as follows:

Sec. 121.312 Material for compartment interiors.

After October 24, 1968, upon the first major overhaul of an aircraft cabin or refurbishing of the cabin interior all materials in each compartment used by the crew or passengers that do not meet Sec. 25.853 must be replaced with materials that meet that requirement.

Sec. 121.319 [Deleted]

35. Section 121.319 is deleted.

36. Section 121.391 is amended as follows:

a. Paragraph (a) is amended to read as follows:

Sec. 121.391 Flight attendants.

(a) Each certificate holder shall provide at least the following flight attendants on each passenger-carrying airplane used;

(1) For airplanes having a seating capacity of more than nine but less than 45 passengers - one flight attendant.

(2) For airplanes having a seating capacity of more than 44 but less than 100 passengers - two flight attendants.

(3) For airplanes having a seating capacity of more than 99 passengers - two flight attendants plus one additional flight attendant for each unit (or part of a unit) of 50 passenger seats above a seating capacity of 99 passengers.

b. Paragraph (b) is amended by adding the following flush sentence: "However, no certificate holder may take off an airplane with fewer flight attendants than the number used in conducting the emergency evacuation demonstration required by Sec. 121.291 of this chapter."

c. A new paragraph (d) is added to read as follows:

(d) During takeoff and landing, flight attendants shall be located as near as practicable to floor level exits and shall be uniformly distributed throughout the airplane in order to provide the most effective egress of passengers in event of an emergency evacuation.

Sec. 121.571 [Amended]

37. Section 121.571 is amended by adding a flush sentence at the end of paragraph (b) to read as follows: "Each card required by this paragraph must contain information that is pertinent only to the type and model airplane used for that flight."

38. A new Sec. 121.589 is added to read as follows:

Sec. 121.589 Carry-on baggage.

(a) No certificate holder may permit a passenger to carry any article of baggage aboard an airplane unless --

- (1) That article is stowed in a suitable baggage or cargo storage compartment, or is stowed as provided in paragraph (c) of section 121.285; or
 - (2) That article can be stowed under a passenger seat.
- (b) After April 24, 1969, no certificate holder may permit a passenger to carry any article of baggage aboard an airplane under paragraph (a)(2) of this section unless that article can be stowed under a passenger seat in such a way that it will not slide forward under crash impacts severe enough to induce the inertia loads specified in Sec. 25.561(b)(3).

39. Paragraph (a) of Appendix D to Part 121 is amended to read as follows:

Appendix D

Criteria for Demonstration of Emergency Evacuation Procedures Under Sec. 121.291

(a) *Aborted takeoff demonstration.*

- (1) The demonstration must be conducted either during the dark of the night or during daylight with the dark of the night simulated. If the demonstration is conducted indoors during daylight hours. It must be conducted with each window covered and each door closed to minimize the daylight effect. Illumination on the floor or ground may be used, but it must be kept low and shielded against shining into the airplane's windows or doors.
- (2) The airplane must be a normal ground attitude with landing gear extended.
- (3) Stands or ramps may be used for descent from the wing to the ground. Safety equipment such as mats or inverted life rafts may be placed on the ground to protect participants. No other equipment that is not part of the airplane's emergency evacuation may be used to aid the participants in reaching the ground.
- (4) The airplane's normal electrical power sources must be deenergized.
- (5) All emergency equipment for the type of passenger-carrying operation involved must be installed in accordance with the certificate holder's manual.
- (6) Each external door and exit, and each internal door or curtain must be in position to simulate a normal takeoff.
- (7) A representative passenger load of persons in normal health must be used. At least 30 percent must be females. At least 5 percent must be over 60 years of age with a proportionate number of females. At least 5 percent but not more than 10 percent must be children under 12 years of age, prorated through that age group. Three life-size dolls, not included as part of the total passenger load, must be carried by passengers to simulate live infants 2 years old or younger. Crewmembers, mechanics, and training personnel, who maintain or operate the airplane in the normal course of their duties, may not be used as passengers.
- (8) No passenger may be assigned a specific seat except as the Administrator may require. Except as required by item (12) of this paragraph, no employee of the certificate holder may be seated next to an emergency exit.
- (9) Seat belts and shoulder harnesses (as required) must be fastened.
- (10) Before the start of the demonstration, approximately one-half of the total average amount of carry-on baggage, blankets, pillows, and other similar articles must be distributed at several locations in the aisles and emergency exit access ways to create minor obstructions.
- (11) The seating density and arrangement of the airplane must be representative of the highest capacity passenger version of that airplane the certificate holder operates or proposes to operate.
- (12) Each crewmember must be a member of a regularly scheduled line crew, must be seated in his normally assigned seat for takeoff, and must remain in that seat until he receives the signal for commencement of the demonstration.
- (13) No crewmember or passenger may be given prior knowledge of the emergency exits available for the demonstration.
- (14) The certificate holder may not practice, rehearse, or describe the demonstration for the participants nor may any participant have taken part in this type of demonstration or a gear-up crash landing demonstration within the preceding 6 months.

(15) The pre-takeoff passenger briefing required by Sec. 121.571 may be given in accordance with the certificate holder's manual. The passengers may also be warned to follow direction of crewmembers, but may not be instructed on the procedures to be followed in the demonstration.

(16) If safety equipment as allowed by item (4) of this section is provided, either all passenger and cockpit windows must be blacked out or all of the emergency exits must have safety equipment in order to prevent disclosure of the available emergency exits.

(17) Not more than 50 percent of the emergency exits may be used for the demonstration. Exits that are not to be used in the demonstration must have the exit handle deactivated or must be indicated by red lights, red tape, or other acceptable means, placed outside the exits to indicate fire or other reason that they are unusable. The exits to be used must be representative of all of the emergency exits on the airplane and must be designated by the certificate holder, subject to approval by the Administrator. At least one floor level exit must be used.

(18) All evacuees, except those using an over-the-wing exit, must leave the airplane by a means provided as part of the airplane's equipment.

(19) The certificate holders approved procedures and all of the emergency equipment that is normally available, including slides, ropes, lights, and megaphones, must be fully utilized during the demonstration.

(20) The evacuation time period is completed when the last occupant has evacuated the airplane and is on the ground. Evacuees using stands or ramps allowed by item (3) above are considered to be on the ground when they are on the stand or ramp: *Provided*, That the acceptance rate of the stand or ramp is no greater than the acceptance rate of the means available on the airplane for descent from the wing during an actual crash situation.

39. Paragraph (b) of Appendix D to Part 121 is amended to read as follows:

(b) *Gear-up crash landing demonstration*. The demonstration must assume the following conditions:

(1) Daylight hours exist outside the airplane.

(2) The airplane was involved in an unanticipated gear-up crash landing.

(3) All required flight crewmembers are incapacitated.

(4) All regularly assigned flight attendants are available to conduct the evacuation. In addition, the evacuation demonstration must be conducted under the conditions of Nos. (4) - (20) of the aborted takeoff demonstration, except that a stand must be placed at each emergency exit or wing with the top platform of the stand level with the bottom of the fuselage.

Issued in Washington, DC, on September 15, 1967.

William F. McKee,

Administrator.

[FR Doc. 67-11032; Filed 9-18-67; 8:50 am]

Notice of Proposed Rulemaking Actions:

Notice of Proposed Rulemaking. Notice No. 66-26; Issued on 07/26/66.

Other Final Rule Actions:

Not Applicable.