

Federal Aviation Administration

FAR NPRM

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DEPARTMENT OF TRANSPORTATION
Federal Aviation Agency
14 CFR Parts 21 and 25
[Docket No. 7522; Notice No. 66-26]

Crashworthiness and Passenger Evacuation

AGENCY: Federal Aviation Administration, DOT
ACTION: Notice of Proposed Rulemaking

14 CFR Parts 21, 25, 37, 121
Standards and Operating Rules

SUMMARY: The Federal Aviation Agency is considering amending Parts 21, 25, 37, and 121 of the Federal Aviation Regulations, as hereinafter set forth, to improve the emergency evacuation equipment requirements and operating procedures for transport category airplanes.

DATES: Comments due on or before September 30, 1966.

SUPPLEMENTARY INFORMATION:

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Communications should identify the regulatory docket or notice number and be submitted in duplicate to the Federal Aviation Agency, Office of the General Counsel, Attention: Rules Docket, 800 Independence Avenue SW., Washington, D.C. 20553. All communications received on or before September 30, 1966, will be considered by the Administrator before taking action on the proposed rule. The proposals contained in this notice may be changed in light of comments received. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons.

On February 23, 1966, the Federal Aviation Agency announced a conference to be held on March 29-30, 1966, to discuss regulatory standards involving crashworthiness and passenger evacuation of transport category airplanes and problems associated therewith. As indicated in that announcement, in January of this year, the FAA established an Agency Task Force to study factors affecting crashworthiness and evacuation that were brought to light by recent accident investigations, to review the adequacy of existing regulations, and to recommend regulatory changes as necessary. In addition, the Agency held a conference from April 25-29, 1966, to review all of the airworthiness standards for Transport Category Airplanes, Part 25 of the Federal Aviation Regulations.

Based on studies by the Agency's Task Force and on discussions with the industry during the March and April conferences, the Agency believes that additional regulations are needed to improve the crashworthiness and emergency evacuation standards: of existing transport category airplanes, of transport category airplanes currently being type certificated, and of those to be type certificated in the future. Advances in the state of the art in the design and manufacture of evacuation equipment, such as slides, have made possible improvements that were not feasible at the time the Agency adopted its most recent extensive regulations in this area (Amendments 25-1 and 121-2, adopted March 3, 1965, 30 F.R. 2300). All of the proposed items would apply to airplanes for which an application for a type certificate was made after the effective date of these proposed amendments. In addition, the Agency proposes to make the new requirements applicable to those airplanes for which type certificates are issued after the effective date of this amendment, irrespective of the date of application for that type certificate. This requirement would also apply to supplemental type certificates and amendments to type certificates involving an increase in passenger seating capacity. While some of the proposed items, as a practical matter, could not be incorporated in the existing aircraft fleet, other items do lend themselves to retrofitting. In this connection, for air carriers and commercial operators under Part 121, the Agency proposes to make the retrofitting requirements applicable after specified dates, that are designed to provide an adequate time for the necessary equipment purchases and installation.

The following discussion relates to the more significant proposals presented in this notice. For convenience, the various proposals are identified as to whether they apply to Part 25, Part 121 or both.

Door requirements (Parts 25 and 121). Studies of actual emergency situations and of demonstrations conducted under FAR Part 121 show that regardless of the adequacy of the briefings of passengers or of the proximity of other emergency exits there is a natural tendency for a certain number of passengers to try to leave by the same route they entered the airplane. Therefore, the Agency proposes to require that each passenger door in the side of the fuselage, whether or not it is a required emergency exit, must meet all of the emergency exit requirements. The Agency proposes to make the Part 121 retrofitting requirements applicable June 30, 1969, and to provide for the approval of deviations if special circumstances exist that make compliance impractical and if the proposed deviation provides an equivalent level of safety. Since passenger doors in the side of the fuselage will be required to meet all of the requirements for a required emergency exit, it is proposed to amend Sec. 25.803(b) to limit its applicability to passenger ventral, passenger tail cone, crew access, and service doors so that these type doors may be considered emergency exits if they meet all of the applicable requirements.

Sideward facing seats (Parts 25 and 121). The Agency has found that the current requirements for protection of seat occupants (Sec. 25.785(c)) are not adequate for sideward facing seats. This results from the fact that a seat belt is inadequate protection against head and neck injury from inertia forces in a sideward direction under the emergency landing conditions of Sec. 25.561. Therefore, the Agency proposes to amend Sec. 25.785(c) to require that each occupant in a sideward facing seat must be protected from head injury by a safety belt and a cushioned rest that will support the arms, shoulders, head, and spine. Part 121 operators would be required to comply with this provision by June 30, 1968.

Emergency evacuation demonstrations (Parts 25 and 121). Amendment 121-2 required all air carriers and commercial operators operating under FAR Part 121 to demonstrate by October 6, 1965, that "the emergency procedures for each type and model of airplane with a seating capacity of more than 44 passengers, used in its passenger-carrying operations allow the evacuation of its full seating capacity in 2 minutes or less, and through not more than 50 percent of its emergency exits." No comparable requirement was made applicable to the airplane manufacturers. Instead, traditionally, it has been considered sufficient to provide the necessary components for an emergency evacuation system through the detailed quantitative requirements prescribed in the airworthiness rules.

However, experience has shown that compliance with these detailed requirements does not ensure that the airplane can be evacuated, during an emergency, within an acceptable time

interval. Differences in the relationships between elements of the emergency evacuation system introduce a considerable variation in evacuation time, and this variation is expected to be even more marked on larger transport aircraft now under development. To make certain that airplanes undergoing type certification can be evacuated within an acceptable time interval, the Agency proposes to require manufacturers to demonstrate prior to type certification that each airplane with a seating capacity of more than 44 passengers can be evacuated under certain specified conditions within a reasonable period of time. In this connection, the Agency now proposes to require emergency evacuation demonstrations under both Parts 25 and 121 to be conducted within 90 seconds. The decrease of 30 seconds from the present requirement of Sec. 121.291 is made possible by equipment advances (primarily the improved automatically deployed and inflated slides) that have occurred since that standard was adopted. The slides now available have in some cases decreased the time needed for evacuation by 30 seconds and more. Since the Agency proposes to require these newly developed slides to be installed after June 30, 1968, on all airplanes operated under Part 121 it will not be necessary to require demonstrations to comply with the 90-second requirement of airplanes that met the 2-minute requirement before installation of the fully automatic type slides. Furthermore, once a manufacturer has successfully conducted a demonstration for a particular airplane type it is not proposed to require a repeated test for each variation in cabin configuration or increase of not more than 5 percent in passenger seating capacity, if the manufacturer can show that the differences can be evaluated analytically by comparison with the test actually conducted.

Since a manufacturer will be demonstrating the basis capability of a new airplane type without regard to crewmember training, operating procedures, and similar items, that are of concern to an operator under Part 121, the criteria to be prescribed under Part 25 are not identical with those in Part 121.

With respect to the evacuation demonstration requirements of Part 121 (contained in Appendix D) the Agency proposes to make the following changes:

1. The limitation on the authority to use a stand or ramp "at the trailing edge" for descent from the wing to the ground would be removed (present item 16).
2. "Mechanics and training personnel" employed by a certificate holder would also be excluded from participation in demonstrations (present item 8).
3. The amount of baggage, blankets, pillows, and similar items that must be distributed throughout the cabin would be required to be approximately one-half of the total of such items normally aboard a fully loaded flight (present item 9).
4. Participants in a demonstration would be prohibited from taking part in another demonstration for at least 6 months. In addition, the amount of briefing that may be given to participants would be clarified to make it clear that participants may be given safety warnings such as to follow crewmember instructions (present item 13).
5. The requirement for use of not more than 50 percent of the airplane exits would be changed to prevent the use in a gear-up crash landing demonstration of a one of a kind exit such as a ventral stair or tail cone exit. Furthermore, the usable exits selected by the certificate holder would have to be approved by the Administrator.
6. Paragraph (b) of Appendix D would be amended to make it clear that the required demonstration is to be an "unanticipated gear-up crash landing" and not a planned one in which all of the emergency equipment is prepared for evacuation prior to the start of the demonstration. This paragraph would also be amended to prohibit the use of any stand higher than the lowest point of the bottom of the fuselage. This clarification is needed because some operators attempted to justify the placing of stands within a few inches of the exits by assuming a crushed fuselage.

Size of Type I emergency exits (Part 25). Section 25.807 presently requires that Type I emergency exits must "have a rectangular opening of not less than 24 inches wide by 48 inches high." As a practical matter, in modern transport category airplanes the doors in the side of the fuselage that qualify as Type I exits are, in virtually all cases, substantially larger than this minimum. However, should the manufacturers meet only the 48-inch minimum requirement, the evacuation rate for both present and future airplanes would be considerably reduced. Therefore,

the Agency believes that retention of the 48-inch minimum height for Type I exits is no longer justified and proposes that it be increased to 60 inches.

Ventral and tail cone exits (Part 25). Airplanes have recently been designed with ventral and tail cone exits and requests for increases in passenger capacity based upon the installation of such exits have been received. Since there are no standards for these exits, each request has been evaluated on its own merits to determine its adequacy and additional passenger credit has been given based on this individual evaluation. As a result of these individual cases, the Agency has given considerable thought to these type exits and has concluded that while they have merit, they nevertheless have an inherent limitation relative to conventional exits in that they are a single exit per airplane rather than one per side. This, plus their location makes them somewhat less effective than a pair of fuselage side doors. Therefore, the Agency believes that the number of additional passengers that may be approved for the addition of a ventral exit should be limited to 10. For the additional tail cone exits, the number of additional passengers should be limited to 15 or 20, depending upon whether the exit incorporates an opening equivalent to at least a Type III emergency exit or an opening the size of a Type I exit. It is proposed to amend Sec. 25.807 to set forth these limitations and to define these two types of exits.

Emergency exits (Part 25). While the airworthiness requirements now prescribe the minimum number and types of exits on each side of the fuselage for specified passenger seating capacities, the Agency has not in the past specified that the required exits be uniformly distributed throughout the passenger compartment. Historically, the absence of such a requirement could be justified by the traditional airplane configurations that resulted in the larger floor level exits being located in the aft portion of the passenger compartments and the smaller exits being located approximately in the center, over the wing. However, the advent of the swept wing turbojet airplane has disrupted this reasonably uniform distribution. It does not require any detailed research or accident investigations to show that there is a direct relationship between the proximity of an exit to a passenger and that passenger's chances for escape in an emergency situation. Therefore, the Agency proposes to require that emergency exits be distributed as uniformly as possible throughout the passenger compartment. In addition, where more than one floor level exit is required on each side of the fuselage, one such exit (on each side) would be required at each end.

The Agency proposes to amend the emergency exit requirements of Sec. 25.807 to require at least one Type I and two Type III exits for 80-109 passengers rather than as presently permitted one each Type I, Type III and Type IV. In addition, the Agency believes that the general provision permitting substitution of two Type IV exits for one required Type III exit should be deleted and that such a substitution be permitted only in the 11-19 passenger capacity category. Since the Agency believes that in the larger passenger configurations, additional exits are necessary, the present table in Sec. 25.807 would be amended to require additional exits in all configurations in excess of 110 passengers and to provide an open ended authorization with a view toward the much larger configurations now being designed.

In line with the foregoing, the Agency considers it appropriate to eliminate the credit in passenger capacity presently given for inflatable slides in order to improve the relationship between the emergency evacuation capability of the airplane and the number of passengers carried.

Since, as previously indicated, substantial improvements have been made in the design and installation of inflatable slides at floor level exits, it is proposed to require automatically deployable and inflatable slides for each landplane emergency exit (other than exits over-the-wing) more than 6 feet from the ground. Specific standards for these slides are proposed including a requirement that they be self-supporting on the ground within 10 seconds of actuation. The provision for automatic inflation would not apply to passenger entrance of service doors.

In addition to the foregoing, the Agency proposes to require that each emergency exit in the passenger compartment in excess of the minimum number of required exits must meet the applicable requirements concerning emergency exit arrangement, marking and lighting. It is also proposed to require that if extended flaps cannot be used as a slide or if the trailing edge of the

lowered flaps is more than 6 feet from the ground means be provided to assist descent from the wing.

Emergency exit marking and interior lighting (Parts 25 and 121). The Agency considers that regulatory action must be taken to overcome the visibility problems associated with a smoke filled cabin. Visibility is appreciably reduced when the cabin is filled with smoke, yet this is the most critical condition for evacuation since no delay in locating emergency exits can be tolerated. To improve this situation, the Agency proposes to require the following:

(1) (Part 25) Means, such as the use of distinctive material on seats adjacent to an exit, or a strobe light under seats at exits, would be required to assist occupants in locating exits in dense smoke.

(2) (Part 25) Contrary to the present regulations, this proposal would require that certain exit locating signs be internally electrically illuminated with a brightness of at least 50-foot lamberts. On the other hand, exit locating signs on a bulkhead or divider that prevents fore and aft vision along the passenger cabin and each exit marking sign may be either internally electrically illuminated or radioactively self-illuminated with an initial minimum brightness of at least 160 microlamberts.

(3) (Part 25) The general cabin interior illumination would have to meet the 0.05-foot candle requirement at each armrest. As a result of a combination of lighting deterioration (aging) and the soiling of cabin interiors, the general interior cabin illumination existing at the time an airplane is type certificated will not exist after the airplane has been in service for any substantial period of time. For operating purposes the Agency considers an average cabin interior illumination of 0.05-foot candles at armrest height (Sec. 121.310(c)(2)) to be the minimum level acceptable for safety. Therefore, to provide a reasonable useful life for the type certificated lighting, the Agency proposes to require that for type certification the interior illumination must meet the 0.05-foot candle requirement at each armrest.

(4) (Part 25) The floor illumination at floor level emergency exits would have to be at least 2-foot candles.

(5) (Parts 25 and 121) Emergency lighting systems would have to be designed so that the lights are manually operable from both the flight crew station and a flight attendants location and once armed would have to continue to function whenever the main lighting system failed. Thus, sole dependence on an inertia switch would not suffice. An amendment to the operating rule in Part 121 would require the emergency system to be turned on before each takeoff and landing. In addition, new aircraft would be required to be designed so that in the event of cabin breakup the emergency lights, except those emergency lights damaged in the breakup, would continue to function.

Exterior marking (Parts 25 and 121). The present exterior marking requirements call for a reflectance ratio of 3-1 between the color of the band outlining the exit and its background color. This ratio has proved effective except where one of the colors has a very low reflectance value. Therefore, the Agency proposes to require that the reflectance of the lighter color must be at least 45 percent whenever the reflectance of the darker color is 15 percent or less and that at least a 30-percent difference be provided whenever the reflectance of the darker color is greater than 15 percent.

In connection with the foregoing, the American Association of Airport Executives requested that the current regulations be amended to allow the use of a strobe light, operated by a crash inertia switch and mounted in the exit window so that it could be visible inside as well as outside the aircraft, in lieu of the required 2-inch colored band. Most of the argument offered in support of this request stressed the difficulties that have been encountered in locating wreckage. While the colored band and a crash locator serve two different purposes, the Agency has no objection to the use of a strobe light in addition to the colored band. However, the Agency does not consider that a strobe light should be allowed in lieu of a color band since, in contrast to the color band, the effectiveness of the strobe light depends on the reliability of the mechanical functioning of the light, adequate battery power, and integrity of the circuit.

In addition to the foregoing, since passenger emergency exits other than those in the side of the fuselage of an airplane, such as ventral and tail cone exits, are relatively uncommon, the

Agency proposes to require more conspicuous marking for these exits. When the means for opening the exit is located on only one side of the fuselage, it is proposed to require a marking to that effect on the other side of the fuselage.

The Agency also proposes to amend Sec. 121.310(g) to make it clear that the exterior marking requirements apply only to passenger emergency exits.

Exterior lighting (Parts 25 and 121). The current regulations do not include requirements for exterior illumination of an airplane. Thus regardless of the efficiency of the interior illumination, exit markings, slides, or other evacuation means, the effectiveness of the evacuation could be substantially reduced by the inability of the passengers to find their way once they were outside the airplane. Therefore, it is proposed to require external illumination at overwing exits to light the area on which evacuees would be walking. The escape route would also have to be indicated by a white slip-resistant surface to guide evacuees to the places provided for descent from the wings. As proposed, the descent means would also have to be illuminated. Part 121 operators would be required to meet these requirements by June 30, 1969.

Emergency exit access and effectiveness (Parts 25 and 121). The present regulations permit minor obstructions in the access from the aisle to each Type III or Type IV exit if there are compensatory factors to maintain the effectiveness of the exit. As proposed herein, this provision would be eliminated and the effectiveness of these exits for emergency evacuation would be further improved by requiring that the projected exit opening, from the opening to the aisles must not be obstructed by any seat back.

The current regulations prescribe a minimum aisle width of 18 inches at 25 inches and more from the floor for airplanes having a passenger seating capacity of 10 or less. However, the Agency has now determined that for airplanes having a passenger seating capacity of 10 or less, a 15-inch aisle width at 25 inches and more from the floor is adequate and the table in Sec. 25.815 would be amended accordingly.

It is also proposed to limit the number of seats abreast in airplanes having only one passenger aisle to not more than six.

Compartment interiors (Parts 25 and 121). The current requirements for flame resistant material in passenger and crew compartments were designed primarily to prevent serious fires from passenger carelessness, such as cigarette burns. However, recent events have shown that these fire protection requirements must be amplified in order to provide protection from an occurrence such as a fuel fire. Since extensive research is still being conducted to determine the full extent to which the materials currently available produce smoke and toxic fumes, the Agency is not in a position to make complete proposals on this matter. However, within the present state of the art, it is considered possible, and practical to require that materials used in passenger and crew compartments meet a specified horizontal and vertical burn rate when tested in accordance with test procedures outlined in Federal Specification CC-T-191b or an equivalent test method. While it is not practical to require retrofitting of all existing airplanes operating under part 121, the Agency proposes to require that after June 30, 1968, all materials used to replace material installed in the passenger cabin and flight deck area meet the requirements proposed in this notice.

Landing gear, electrical cables and fuel lines (Part 25). In order to prevent fires following failure of the landing gear and the rupturing of fuel and electrical lines in the fuselage, the Agency proposes to require that the main landing gear system be designed so that if it fails due to overloads during takeoff and landing, the failure mode is not likely to puncture any part of the fuel system. Moreover, it is proposed to require that electrical cables be isolated from fuel lines and that both be designed to allow a reasonable degree of deformation and stretching without failure or leakage.

Seat and seat attachment strength requirements. Under dates of April 28, 1965, and March 7, 1966, the Agency received petitions from Dr. Horace E. Campbell requesting, among other things, changes in the regulations concerning seat and seat attachment strength requirements (including load factors and occupant weights) and requiring unobstructed passage to midsection exits on transport airplanes. At the present time, the Agency does not believe that there is sufficient evidence to establish that current seat and attachment strength requirements are

inadequate. However, a project is now underway at the National Aviation Facilities Experimental Center (NAFEC) to determine the relationship which may exist between static and dynamic load. Values of load factor, occupant weight, and time duration of load application will be quantitatively determined so that fully dynamic crash loads standards can be formulated. Therefore, until its research program is completed and the results evaluated, the Agency is not in a position to recommend changes to the seat and attachment strength requirements or the related problems of load factors and passenger weights. On the other hand, this notice does contain specific proposals under Sec. 25.813 concerning the obstruction of exit passageways.

Technical Standard Orders (Part 37). Appropriate changes are also proposed to the Technical Standard Orders (TSO's) covering Safety Belts, Aircraft Seats and Berths, and Individual Flotation Devices consistent with the fire protection requirements proposed for compartment interiors. The TSO concerning Emergency Evacuation Slides would also be amended consistent with the inflation requirements proposed under Sec. 25.809.

Flight attendants (Part 121). Present Sec. 121.391 contains requirements for flight attendants for passenger-carrying airplanes and requires at least three flight attendants for an airplane having a seating capacity of more than 99 but less than 150 passengers and four flight attendants for airplanes having a passenger seating capacity of more than 149 passengers. This section also provides the criteria by which an operator may obtain from the Administrator approval of a fewer number of flight attendants for a particular operation. The Agency proposes to amend this section to require one flight attendant for each increment of 50 passenger seats (or any part thereof) over 99. This proposal anticipates the much higher passenger seating capacity airplanes presently being planned. Also, approval of a lesser number would be limited to those situations where the certificate holder is able to show that he can meet the emergency evacuation demonstration requirements with the fewer number.

Passenger briefing (Part 121). The Agency has found that in most cases the present passenger briefing procedures do not provide the passenger with the level of knowledge that is necessary to prepare him for an emergency situation. Pending further recommendations from a study now being made to find better briefing methods, the Agency proposes as an interim step to require that each passenger over 12 years of age be given a briefing card of the type now required by Sec. 121.571 as he enters the airplane. Furthermore, the Agency proposes to limit the information that may be printed on the card to information relevant to the type and model airplane being used on that flight. Presently, some of these cards contain diagrams of more than one airplane configuration which only tends to confuse the passenger.

Carry-on baggage. Existing regulations contain detailed requirements for the storage of cargo in passenger cabins. However, those items traditionally classified as "carry-on baggage" have for the most part been handled in accordance with the policy of each operator with guidance from the FAA inspectors. Recent developments such as "shuttle" flights and "space available student fares" have increased the number of situations where passengers are boarding the airplane at the last minute carrying more baggage than probably would be the case if they had a confirmed reservation and checked in at the ticket counter prior to departure. The amount of carry-on baggage being stored on and around passenger seats has therefore increased to a point that it could cause a dangerous situation in an emergency. The Agency, therefore, proposes to limit those items that passengers be permitted to take to their seats to items that can be stored under a passenger seat in such a way that they would not slide forward in the event of a crash.

The Proposed Amendment:

In consideration of the foregoing, it is proposed to amend Parts 21, 25, 37 and 121 of the Federal Aviation Regulations as follows:

1. By amending Sec. 21.17(a) 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.

* * * * *

1a. By amending the introductory statement in Sec. 21.101(a) 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 a type certificate must comply with either --

* * * * *

2. By adding a new Sec. 25.2 after Sec. 25.1 to read as follows:

Sec. 25.2 Special retroactive requirements.

Notwithstanding Secs 21.17 and 21.101 of this chapter, after (the effective date of this amendment) 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, must show that the airplane concerned meets the requirements of Secs. 25.721(d), 25.783, 25.785(c), 25.803(b), (c), and (d), 25.807(a)(1), (5), and (6) and (c), and (d), 25.809(f) and (h), 25.811, 25.812, 25.813(a), (b), and (c), 25.815, 25.817, 25.853(a), 25.855(a), 25.993(f), 25.1359(c), effective on (the effective date of this amendment).

3. By adding a new paragraph (d) to Sec. 25.721 to read:

Sec. 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 symmetrical about the longitudinal axis of the airplane) the failure mode is not likely to puncture any part of the fuel system.

4. By amending Sec. 25.783 to read as follows:

Sec. 25.783 Doors.

(a) Each passenger door in the side of the fuselage must qualify as a Type I or a 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 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 with emergency egress through the passenger door.

(b) Each external door, except cargo and service doors not suitable for use as an emergency exit, must be located where person using them will not be endangered by the propellers when appropriate operating procedures are used.

(c) There must be a visual means to signal to appropriate crew members when external doors are closed and fully locked.

(e) Each external door whether or not used as an emergency exit must meet the requirement of Sec. 25.809(d).

5. By amending Sec. 25.785(c) 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 plus a cushioned rest that will support the arms, shoulders, head, and spine. 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 plus a cushioned rest that will support the arms, shoulders, head, and spine.

6. By amending paragraph (b) of Sec. 25.803 and by adding new paragraphs (c) and (d) to read:

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 number of passengers for which certification is requested can be evacuated within 90 seconds. 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 escape apparatus 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 or curtain must be in a position to simulate a normal flight.
 - (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 representing an air carrier crew may be used who have knowledge of the operation of the exits and emergency equipment. 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 is his assigned takeoff and landing seat. They must remain in their assigned seats until receiving the signal for commencement of the demonstration.
 - (7) There can be no practice or rehearsal of the demonstration for the participants, and passengers may be briefed as to the location of all emergency exits before the demonstration, but 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 over-the-wing 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, 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.

7. By amending Sec. 25.807(a) by striking out the number "48" in subparagraph (1) and inserting the number "60" in place thereof and by adding new subparagraphs (5) and (6) to read as follows:

Sec. 25.807 Passenger emergency exits.

(a) * * *

(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 the same rate of egress as a Type I exit.

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

* * * * *

8. By amending Sec. 25.807(c) to read as follows:

Sec. 25.807 Passenger emergency exits.

* * * * *

(c) *Passenger emergency exits; side of fuselage*. 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 and where more than one floor level exit per side is prescribed, at least one floor level exit per side must be located at each end of the cabin.

(1) Except as provided in subparagraphs (2) through (5) of this paragraph, the number and type of passenger emergency exits must be in accordance with the following table:

Passenger seating capacity (cabin attendants not included)	Each side of the fuselage			
	Type I	Type II	Type III	Type IV
1 to 10 inclusive				1
11 to 19 inclusive			1 or 2	
20 to 39 inclusive		1		1
40 to 59 inclusive	1			1
60 to 79 inclusive	1		1	
80 to 109 inclusive	1		2	
110 to 139 inclusive	2	1	1	
140 to 179 inclusive	2	1	2	
180 to 219 inclusive	3	1	1	
220 to 259 inclusive	4		2	
260 to 299 inclusive	5	1 ₁	1	
300 to 339 inclusive	6	1 ₂		

¹These Type II exits must be floor level, over-the-wing, with a stepdown outside the airplane of not more than 17 inches.

(2) Increases in passenger capacity above 339 may be allowed for each additional pair of emergency exits in accordance with the following table:

<i>Additional emergency exits (each side of fuselage)</i>	<i>Increase in passenger capacity allowed</i>
Type I	40
Type II ¹	30
Type III	0
Type IV	0

¹These Type II exits must be floor level. If over-the-wing, they must have a stepdown outside the airplane of not more than 17 inches.

(3) If a passenger ventral or tail cone exit is installed and can be shown to be usable following the collapse of one or more legs of the landing gear, an increase in passenger capacity beyond the limits specified in subparagraphs (1) and (2) of this paragraph may be allowed as follows:

(i) For a ventral exit, 10 additional passengers.

(ii) For a tail cone exit incorporating a floor level Type I size opening in the pressure shell, and incorporating an approved assist means in accordance with Sec. 25.809(f)(1), 20 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 distance, and step-down distance, 15 additional passengers.

(4) 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.

(5) For airplanes on which the vertical location of the wing does not allow the installation of over-the-wing exits, an exit of at least the dimensions of a Type II must be installed at floor level instead of each Type III and each Type IV exit required by subparagraph (1) of this paragraph.

9. By amending Sec. 25.807(d) to read:

Sec. 25.807 Passenger emergency exits.

* * * * *

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

(1) There must be at least one emergency exit for each unit (or part of a unit) of 35 passengers, but no less than two such exits, both above the waterline with one on each side of the airplane, meeting the minimum dimensions of --

(i) A Type IV exit for airplanes with a passenger seating capacity of 10 or less; and

(ii) A Type III exit for airplanes with a passenger seating capacity of 11 or more.

(2) If side exits cannot be above the waterline, the side exits must be replaced by an equal number of 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.

10. By amending Sec. 25.809 by amending paragraph (f) and by adding a new paragraph (h).

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, designed to be available for immediate installation and designed so that when installed it is --

(i) Automatically deployed and inflated concurrent with the opening of the exit except that the device may be inflated in a different manner when installed at service doors that qualify as emergency exits, and at passenger doors; and

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

11. By amending Sec. 25.811 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. Means must be provided to assist the occupants in locating the exits in conditions of dense smoke.

(c) 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.

(d) 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 3/4-inch wide and a head twice the width of the shaft, extending along at least 70 degrees of arc at a radius approximately equal to 3/4 of the handle length; and

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

(c) 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.

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

12. By adding new Sec. 25.812 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 illuminated emergency exit markings and locating signs, sources of general cabin illumination, and additional light in the emergency exit areas, as well as exterior lighting.

(b) The exit locating signs required in Secs. 25.811(c)(1) and (2) must have white letters at least 1 inch high on a red background at least 2 inches high, and must be internally electrically illuminated. The colors may be reversed if this will increase the illumination in the exit area. The unit must contain at least two lamps and utilize a diffusing cover. The brightness at any 1-inch diameter area on the cover, including those containing the legend, must be at least 50-foot lamberts.

(c) The exit locating signs required in Sec. 25.811(c)(3) must be either internally electrically illuminated or radioactively self-illuminated with an initial minimum brightness of at least 160 microlamberts. The sizes and colors must be as prescribed in paragraph (b) of this section. If the sign is internally electrically illuminated, the colors may be reversed if this will increase the emergency lighting illumination.

(d) An exit marking sign having white letters at least one inch high on a red background at least two inches high must be located over each passenger emergency exit. These marking signs may be either internally electrically illuminated, or radioactively self-illuminated with an initial minimum brightness of at least 160 microlamberts. The colors may be reversed in the case of internally electrically illuminated markers if this will increase the illumination at the exit.

(e) General illumination in the passenger cabin must be provided so that when measured along the centerline of the main passenger aisle at seat armrest height the illumination is not less than 0.05 foot-candles.

(f) The floor of the passageway leading to each floor-level passenger emergency exit, between the main aisle and the exit opening, must be provided with illumination of at least 2 foot-candles.

(g) The emergency lighting system must be designed so that --

(1) The lights are operable manually from the flight crew station and from a point in the passenger compartment that is readily accessible to a flight attendant during takeoff and landing; and

(2) When switched on at either station, the lights remain energized after interruption of the airplane's normal electric power.

(h) Exterior emergency lighting must be provided at each overwing exit to illuminate the adjacent wing surface and the escape route from the exit. The escape route must be indicated by a white slip-resistant surface. These lights must operate automatically when the exit is opened.

(i) The means required in Secs. 25.809 (f)(1) and (g) to assist the occupants in descending to the ground must be illuminated.

(j) The energy supply to the emergency lighting units must provide the required level of illumination for at least 30 minutes at 0° F.

(k) 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.

(l) 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).

(m) The emergency lighting system must be so designed that breakup of the fuselage will not render any emergency light inoperative except those emergency lights which may be damaged by the breakup.

13. By amending paragraphs (a), (b), and (c) of Sec. 25.813 to read:

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 and Type IV exit. The access must not be obstructed by seats, berths, or other protrusions which would reduce the effectiveness of the exit. The projected exit opening, from the opening to each aisle, must not be obstructed by any seat back.

14. By amending Sec. 25.815 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 to 19	12	20
20 or more	15	20

15. By adding a new Sec. 25.817 to read as follows:

Sec. 25.817 Maximum number of seats abreast.

On airplanes having only one passenger aisle, the number of seats abreast must not be more than six.

16. By amending Sec. 25.853 by deleting paragraph (b) and by amending paragraph (a) to read as follows:

Sec. 25.853 Compartment Interiors.

For each compartment to be used by the crew or passengers --

(a) All materials, including the wall and ceiling linings, safety belts, upholstery, furnishings (including blankets, pillows, and seat cushions), and the covering of upholstery, furnishings, and floors must meet the following test criteria:

(1) When tested in accordance with the applicable portions of Test Procedure 5906 outlined in Federal Specification CC-T-101b, or an equivalent method, the material must not continue to flame and must not burn for a total length in excess of 1.5 inches, with the material in the horizontal position and with the ignition source applied for at least 12 seconds. In addition, portions or residues which break or drip from the test specimens, must not continue to flame after falling.

(2) When tested in accordance with the applicable portions of Test Procedure 5902 outlined in Federal Specification CC-T-101b, or an equivalent method, the material must not continue to flame for more than two seconds after withdrawal of the ignition source, and must not burn for a total length in excess of 6 inches, with the material in the vertical position with the ignition source

held in place for 12 seconds. In addition, portions or residues which break or drip from the test specimen must not continue to flame after falling.

(b) [Reserved]

17. By amending paragraph (a) of Sec. 25.855 by striking the words "are at least flame resistant" and inserting in place thereof the words "meet the test criteria set forth in Sec. 25.853(a)."

18. By adding a new paragraph (f) to Sec. 25.993 to read:

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 failure or leakage, and must be enclosed in a shroud which is ventilated and drained.

19. By adding a new paragraph (c) to Sec. 25.1359 to read:

Sec. 1359 Electrical system fire and smoke protection.

* * * * *

(c) 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.

20. By amending Sec. 37.132, Safety Belts, TSO-C22e, Sec. 37.136, Aircraft Seats and Berths, TSO-C39, and Sec. 37.178, Individual Flotation Devices, TSO-C72, to require that new models of such equipment must meet the test criteria set forth in proposed Sec. 25.853(a).

21. By amending Sec. 37.157, Emergency Evacuation Slides, TSO-C69, to require that new models of such equipment must be designed so that as used in an aircraft they may be fully inflated in not more than 10 seconds after activation of the inflation means.

22. By Amending Sec. 121.291(a) to read as follows:

Sec. 121.291 Demonstration of emergency evacuation procedures.

(a) Each certificate holder shall show by actual demonstration that the emergency evacuation procedures for each type and model of airplane with a seating capacity of more than 44 passengers, used in its passenger-carrying operations, allow the evacuation of its full seating capacity in 90 seconds or less, through not more than 50 percent of its emergency exits. The demonstrations must be conducted according to the criteria provided in paragraphs (a) Aborted takeoff demonstration, and (b) Gear-up crash landing demonstration, of Appendix D of this Part --

- (1) Upon the initial introduction of a type and model of airplane into passenger-carrying operations;
- (2) Upon a 5 percent or greater increase in passenger seating capacity over that previously approved; or
- (3) Upon a major change in the passenger cabin interior configuration that will affect the emergency evacuation of passengers.

23. By amending Sec. 121.310(a) to require after June 30, 1968, on all passenger-carrying landplanes, at each floor level exit, a self-supporting inflatable slide, or its equivalent, that during flight time meets the requirements of subdivisions (i) and (ii) of Sec. 25.809(f)(1). (See item No. 10 above.)

24. By amending Sec. 121.310(f)(3) to read as follows:

Sec. 121.310 Additional emergency equipment.

* * * * *

(f) * * *

(3) 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. During takeoff and landing each seat back must be in an upright position.

25. By amending Sec. 121.310(g) by adding a new subparagraph (3) to read as follows:

Sec. 121.310 Additional emergency equipment.

* * * * *

(g) * * *

(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 instruction 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.

26. By amending Sec. 121.310 by adding new paragraphs (i), (j), and (k) to read as follows:

Sec. 121.310 Additional emergency equipment.

* * * * *

(i) No person may operate a passenger-carrying airplane unless each approved emergency exit (whether required or not) meets all of the requirements of this section.

(j) After June 30, 1969, no person may operate a passenger-carrying airplane unless it is equipped with external emergency lighting that meets the requirements of Sec. 25.812(h) of this chapter. (See item No. 12 above.)

(k) After June 30, 1969, no person may operate a passenger-carrying airplane unless each floor level exit on the airplane meets all of the emergency exit requirements of this section except that the Administrator may grant a deviation for a floor level exit outside the passenger cabin if he finds that special circumstances exist that make compliance impractical and that the proposed deviation provides an equivalent level of safety.

27. By adding a new section to require that after June 30, 1968, all of the replacement materials covered by Sec. 25.853(a) used in the passenger cabin must meet the test criteria therein. (See item No. 16 above.)

28. By amending Sec. 121.391(a) by striking out subparagraphs (3) and (4) and by inserting in place thereof a new subparagraph (3) to read as follows:

Sec. 121.391 Flight attendants.

* * * * *(3) For airplanes having a seating capacity of more than 99 passengers, one additional flight attendant must be provided for each unit (or part of a unit) of 50 passenger seats.

29. By amending Sec. 121.391 by amending paragraph (b) and by adding a new paragraph (d) to read as follows:

Sec. 121.391 Flight attendants.

* * * * *

(b) No certificate holder may takeoff an airplane with fewer flight attendants than the number used in conducting the emergency evacuation demonstration required by Sec. 121.291 of this chapter. However, upon application by the certificate holder, the Administrator may approve the use of an airplane for a particular operation with less than the number of flight attendants required

by paragraph (a) of this section if the certificate holder shows that it can evacuate the airplane as required by Sec. 121.291 with fewer flight attendants.

* * * * *

(d) During takeoff and landing, flight attendants shall be located as near as practicable to floor level exits and shall be distributed as uniformly as possible throughout the passenger cabin.

30. By adding a new Sec. 121.312 to read as follows:

Sec. 121.312 Sideward facing seats.

After June 30, 1968, each sideward facing seat must meet the requirements of Sec. 25.785(c).

31. By amending Sec. 121.571(b) by adding a flush sentence at the end thereof to read as follows:

Sec. 121.571 Briefing passengers before takeoff.

* * * * *

(b) * * *

Each certificate holder shall distribute to each passenger over 12 years old one copy of the printed briefing card when the passenger boards the airplane. Each card required by this paragraph must contain only information that is pertinent to the type and model airplane being used for the flight.

32. By adding a new Sec. 121.589 to read as follows:

Sec. 121.589 Carry-on baggage.

No certificate holder may permit a passenger to carry any baggage, luggage, or other item of comparable size aboard an airplane unless that item can be stored in a suitable baggage or cargo compartment or unless the item is of a size that can be stored under a passenger seat in such a way that it would not slide forward in the event of a crash.

The amendments are proposed under the authority of sections 313(a), 601, 603, and 604 of the Federal Aviation Act of 1958 (49 U.S.C. 1354, 1421, 1423, 1424).

Issued in Washington, D.C., on July 26, 1966.

C. W. Walker,

Director, Flight Standards Service.

[F.R. Doc. 66-8295; Filed July 28, 1966; 8:47 a.m.]

Other Notice of Proposed Rulemaking Actions:

Not Applicable.

Final Rule Actions:

Final Rule. Docket No. 7522; Issued on 09/15/67.

Lessons Learned Note:

See Docket No. 7522;

EFFECTIVE DATE: This rule becomes effective 20 June 1968 for clarification information.