ARAC WG Report
Fuselage Doors
FAR/JAR 25.783

Category 3

1 - What is underlying safety issue to be addressed by the FAR/JAR?

To protect the airplane and passengers from hazards from the inadvertent opening of doors.

2 - What are the current FAR and JAR standards relative to this subject?

Current FAR text: See FAR 25.783 "Doors", Amdt 25-88 +

Current JAR text: See JAR 25.783 "Doors", Change 14 +

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed?

The existing standard is applied. In addition, some of the recent ATA task force recommendations have been applied with Airworthiness Directives to several fleets and have been imposed on new designs under "unsafe feature" provision of 21.21(b)(2).

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in?:

None. The main objective of the proposed rule is NOT the harmonization of differences

4 - What, if any, are the differences in the current means of compliance?

None. The main objective of the proposed rule is NOT the harmonization of differences.

5 – What is the proposed action?

This proposal replaces the current door standard with a new improved door standard. This new standard would set forth, as a regulatory requirement, some of the existing technical guidance criteria which have been determined to be necessary for safety. In addition, the proposal addresses recommendations from the NTSB and from the FAA chartered ATA task force on doors. NTSB (A-89-92, A-89-93, A-89-94, A-92-21) and ATA recommendations are addressed with specific provisions.

For each proposed change from the existing standard, answer the following questions:

6 – What should the harmonized standard be?

See the draft notice for text. Section 25.783 is completely rewritten and reorganized in order to:

- Separate the cabin safety and airworthiness issues so that section § 25.783 now treats only airworthiness.

- Classify doors based on hazard rather than relying entirely on the inward/outward opening movement.
- Clarify the requirement concerning inadvertent an deliberate opening by persons.
- Clarify the fail safe and reliability provision for the pressurization prevention system.
- Add specific criteria for doors that need no pressurization prevention system.
- Add detail design and fail-safe features of latching and locking mechanisms (from existing advisory).
- Add a requirement to remove all power from the door during flight (NTSB A-92-21)
- Add specific requirement for a latch retention system in addition to locks.
- Add a new fail-safe criterion for the locking system for outward opening doors under pressure.
- Add a new requirement for an aural warning before takeoff for certain doors.
- Add door operator station requirements for advisory and warnings (NTSB A-89-093).
- Proved relief for certain access panels, maintenance doors, and removable emergency exits.
- Amend several cabin safety rules to accept provisions moved from section § 25.783.

7 – How does this proposed standard address the underlying safety issue (identified under #1)?

The rule is set forth with multiple independent layers of safety intended to account for failures, adverse conditions of operation and, in accordance with NTSB recommendation (A-89-94), human error and abuse.

8 – Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.

Overall increase with some relief for specific kinds of doors. See the NPRM discussion section.

9 – Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain.

Same or slight increase. See the NPRM discussion section

10 – What other options have been considered and why were they not selected?:

The HWG has no idea how to answer this question. The only option has been to accomplish the task in a harmonized fashion with full consensus if possible. In doing so, dozens of drafts and thousands of words were considered. The final proposal is the result.

11 - Who would be affected by the proposed change?

The revised rule would be applicable to new airplanes for which the application for type certificate is received after the effective date.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?

The existing advisory material are redrafted. Some specific design criteria (i.e. latching and locking criteria) from the existing AC 25.783-1 are proposed to be included in the rule text. See NPRM.

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted?

No, see the proposed Advisory Circular 25.783-1A

14 - How does the proposed standard compare to the current ICAO standard?

The current ICAO standard has no specific criteria for the airworthiness of doors.

15 - Does the proposed standard affect other HWG's?

Yes, the reorganization aspect of separating cabin safety and airworthiness criteria affects the cabin safety working group. These items have been coordinated with cabin safety specialists and have been structured according to their request.

16 - What is the cost impact of complying with the proposed standard

Economic analysis still to be done but it is expected to be small in comparison to standard industry practice.

17. - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

Advisory Circular AC 25.783-1A is submitted with full consensus of the working group

18.- -Does the HWG wish to answer any supplementary questions specific to this project?

Not at this time.

19. – Does the HWG want to review the draft NPRM at "Phase 4" prior to publication in the Federal Register?

Yes

20. – In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process? Explain.

No, these changes are too extensive, complex and potentially controversial for the Fast Track Process.

[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. ; Notice No.]

RIN: 2120-

Fuselage Doors

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: This notice proposes to amend the design standards for fuselage doors, hatches, and exits on transport category airplanes. This action would improve door integrity by providing design criteria that would ensure that doors will remain secure under all circumstances that service experience has shown can happen. This proposal would adopt several recommendations from the NTSB (National Transportation Safety Board) and from an FAA chartered ATA (Air Transport Association) task force on doors. NTSB safety recommendations, A-89-92, A-89-93, A-89-94, A-92-21, would be addressed with specific provisions. This action also would relieve a certification burden on industry by eliminating differences between the Federal Aviation Regulations (FAR) and European Joint Airworthiness Regulations (JAR) and related certification guidance material.

DATES: Comments must be received on or before [Insert date 90 days after date of publication in the Federal Register].

ADDRESSES: Comments on this document should be mailed or delivered, in duplicate, to: U.S. Department of Transportation Dockets, Docket No. _____, 400 Seventh Street SW., Room Plaza 401, Washington, DC 20590. " Comments also may be sent electronically to the following Internet address: 9-NPRM-CMTS@faa.dot.gov. Comments may be filed and examined in Room Plaza 401 between 10:00 a.m. and 5:00 p.m. weekdays, except Federal holidays.

In addition, the FAA is maintaining an information docket of comments in the FAA, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue S.W., Renton, Washington 98055-4056. Comments in the information docket may be inspected between 7:30 a.m. and 4:00 p.m. weekdays, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: James R. Haynes, Federal Aviation Administration, Airframe/Cabin Safety Branch (ANM-115), Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98055-4056; telephone (425) 227-2131; facsimile (425) 227-1320.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed action by submitting such written data, views, or arguments as they may desire. Comments relating to the environmental, energy, federalism, or economic impact that might result from adopting the proposals in this document are also invited. Substantive comments should be accompanied by cost estimates. Comments must

identify the regulatory docket or notice number and be submitted in duplicate to the DOT Rules Docket address specified above.

All comments received, as well as a report summarizing each substantive public contact with FAA personnel concerning this proposed rulemaking, will be filed in the docket. The docket is available for public inspection before and after the comment closing date.

All comments received on or before the closing date will be considered by the Administrator before taking action on this proposed rulemaking. Comments filed late will be considered as far as possible without incurring expense or delay. The proposals in this document may be changed in light of the comments received.

Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this document must include a pre-addressed, stamped postcard with those comments on which the following statement is made: "Comments to Docket No. _____." The postcard will be date stamped and mailed to the commenter.

Availability of NPRM

An electronic copy of this document may be downloaded using a modem and suitable communications software from the FAA regulations section of the Fedworld electronic bulletin board service (telephone: 703-321-3339), the Government Printing Office's (GPO) electronic bulletin board service (telephone: 202-512-1661), or, if applicable, the FAA's Aviation Rulemaking Advisory Committee bulletin board service telephone: 800-322-2722 or 202-267-5948).

Internet users may reach the FAA's web page at http://www.faa.gov/avr/arm/nprm/nprm.htm or the GPO's webpage at

http://www.access.gpo.gov/nara for access to recently published rulemaking documents.

Any person may obtain a copy of this document by submitting a request to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue, SW., Washington, DC 20591; or by calling (202) 267-9680. Communications must identify the notice number or docket number of this NPRM.

Persons interested in being placed on the mailing list for future rulemaking documents should request from the above office a copy of Advisory Circular No. 11-2A, Notice of Proposed Rulemaking Distribution System, which describes the application procedure.

Background

Following a major accident in 1974, which involved the opening of a fuselage door on a transport category airplane during flight, the FAA amended the applicable safety standards to provide a higher level of safety for fuselage doors. The FAA issued Amendment 25-54 to 14 CFR part 25 (45 FR 60172, September 11, 1980), the objective of which was to provide a level of safety in doors consistent with the level of safety required for other critical systems on the airplane, such as primary flight controls. This was achieved by requiring redundancy and fail-safe features in the door operating systems, and by providing protection from anticipated human errors.

In 1989, another wide-body transport category airplane lost a lower lobe cargo door, along with a portion of fuselage structure above the door, during flight. Because of this accident and other similar accidents, the FAA requested the Air Transport Association (ATA) to form an industry task force to review door designs

on transport category airplanes. This group was chartered to review the design and operation of doors on the current fleet of transport airplanes, and to recommend actions that would prevent any further inadvertent opening of outward opening doors. The group also was requested to review pertinent current regulations and advisory material, and to provide recommendations for necessary rule changes. The ATA provided its recommendations to the FAA in report entitled, "ATA Cargo Door Task Force Final Report," dated May 15, 1991.

As a result of its investigation of the airplane accident(s) associated with fuselage doors opening during flight, the National Transportation Safety Board (NTSB) also issued the following Safety Recommendations relating to doors on transport category airplanes, for consideration by the FAA:

Safety Recommendation A-89-092: Issue an airworthiness directive (AD) to require that the manual drive units and electrical actuators for Boeing 747 cargo doors have torque-limiting devices to ensure that the lock sectors, modified in accordance with the requirements of AD-88-12-04 [amendment 39-5934 (53 FR 18079, May 20, 1988)], cannot be overridden during mechanical or electrical operation of the latch cams.

Safety Recommendation A-89-093: Issue an airworthiness directive for non-plug cargo doors on all transport category airplanes requiring the installation of positive indicators to ground personnel and flightcrews confirming the actual position of both the latch cams and locks, independently.

Safety Recommendation A-89-094: Require that fail-safe design considerations for non-plug cargo doors on present and future transport category

airplanes account for conceivable human errors in addition to electrical and mechanical malfunctions.

Safety Recommendation A-92-21: Require that the electrical actuating systems for non-plug cargo doors on transport category aircraft provide for the removal of all electrical power from circuits on the door after closure (except for any indicating circuit power necessary to provide positive indication that the door is properly latched and locked) to eliminate the possibility of uncommanded actuator movements caused by wiring short circuits.

The FAA has responded to these safety recommendations by issuing various airworthiness directives, applicable to the current fleet of transport category airplanes, and requiring relevant modifications and inspections of the fuselage doors.

Harmonization of Regulations

The airworthiness standards for transport category airplanes are contained in 14 CFR part 25 [commonly referred to as the Federal Aviation Regulations (FAR), part 25]. Manufacturers of transport category airplanes must show that each airplane they produce of a different type design complies with the relevant standards of part 25. These standards apply to airplanes manufactured within the U.S. for use by U.S.-registered operators, and to airplanes manufactured in other countries and imported to the U.S. under a bilateral airworthiness agreement.

In Europe, the Joint Aviation Requirements (JAR) were developed by the Joint Aviation Authorities (JAA) to provide a common set of airworthiness standards for use within the European aviation community. The airworthiness standards for European type certification of transport category airplanes are contained in JAR-25, and are based on part 25. Airplanes certificated to the JAR-25

standards, including airplanes manufactured in the U.S. for export to Europe, receive type certificates that are accepted by the aircraft certification authorities of 26 European member countries.

Although part 25 and JAR-25 are very similar, they are not identical in every respect. Differences between the FAR and the JAR can result in substantial additional costs when airplanes are type certificated to both standards. These additional costs, however, frequently do not bring about an increase in safety. For example, part 25 and JAR-25 may use different means to accomplish the same safety intent. In this case, the manufacturer is usually burdened with meeting both requirements, although the level of safety is not increased correspondingly. Recognizing that a common set of standards would not only economically benefit the aviation industry, but also would maintain the necessary high level of safety, the FAA and JAA consider "harmonization" of the two sets of standards to be a high priority.

In 1988, the FAA, in cooperation with the JAA and other organizations representing the American and European aerospace industries, began a process to "harmonize" the airworthiness requirements of the United States and the airworthiness requirements of Europe.

In 1991, the FAA harmonization effort was undertaken by the Aviation Rulemaking Advisory Committee (ARAC).

The Aviation Rulemaking Advisory Committee

The ARAC was formally established by the FAA on January 22, 1991, and announced to the public on that same day in the Federal Register (56 FR 2190). The task of ARAC is to provide advice and recommendations concerning the full range

of the FAA's safety-related rulemaking activity. This advice is sought to develop better rules in less overall time using fewer FAA resources than are currently needed. The committee provides the opportunity for the FAA to obtain firsthand information and insight from interested parties regarding proposed new rules or revisions of existing rules.

There are 64 member organizations on the committee, representing a wide range of interests within the aviation community. Meetings of the committee are open to the public, except as authorized by section 10(d) of the Federal Advisory Committee Act.

The ARAC establishes separate individual working groups to develop proposals to recommend to the FAA for resolving specific issues. Tasks assigned to working groups are published in the Federal Register. Although working group meetings are not generally open to the public, all interested parties are invited to participate as working group members. Working groups report directly to the ARAC, and the ARAC must accept a working group proposal before that proposal can be presented to the FAA as an advisory committee recommendation for rulemaking. (The activities of the ARAC will not, however, circumvent the public rulemaking procedures. After an ARAC recommendation is received and found acceptable by the FAA, the agency proceeds with the normal public rulemaking procedures. Any ARAC participation in a rulemaking package will be fully disclosed in the public docket.)

In 1996, the harmonization effort was undertaken by the ARAC to harmonize the airworthiness standards related to fuselage doors. A working group of industry and government structures specialists from Europe, the United States,

and Canada was established under the aegis of ARAC and chartered by notice in the Federal Register (61FR26247, May 24, 1996). The working group was tasked to develop recommendations concerning new or revised requirements for installation of fuselage doors on transport category airplanes. The JAA is to develop a similar proposal to amend JAR-25, as necessary, to achieve harmonization.

The harmonization effort has now progressed to a point where a specific proposal has been developed by the working group and has been recommended to the FAA by ARAC for consideration as possible rulemaking. The rulemaking proposal contained in this notice is based on those recommendations developed by the working group.

Discussion

The scope of this proposal is to revise and reorganize the existing rules in 14 CFR part 25 to provide the following:

1. Clarification of the existing design requirements for doors.

2. Definitive criteria for the door design requirements that are currently covered in the existing rules by general text.

3. Additional fail-safe requirements and detailed door design requirements, based on the recommendations of the NTSB and the ATA, and on current industry practice.

Definitions

For the purpose of understanding the remainder of this proposal, the following definitions are provided.

A latch is a movable mechanical element that, when engaged, prevents the door from opening.

A lock is a mechanical element that monitors the latch position, and when engaged, prevents the latch from becoming disengaged.

Latched means the latches are fully engaged with their structural counterparts and held in position by the latch operating mechanism.

Locked means the locks are fully engaged.

Latching mechanism includes the latch operating mechanism and the latches.

Locking mechanism includes the lock operating mechanism and the locks.

Closed means that the door has been placed within the doorframe in such a position that the latches can be operated to the "latched" condition.

Fully closed means that the door is placed within the doorframe in the position it will occupy when the latches are in the latched condition.

Discussion of Proposed Changes

This action proposes changes mainly to § 25.783, "Doors." First, the title of § 25.783 would be changed from the current "Doors" to "Fuselage doors" in order to more accurately reflect the applicability of this revised section. The term "doors," as used in the proposed revision of § 25.783, would also include hatches, openable windows, access panels, covers, etc., on the exterior of the fuselage that do not require the use of tools to open or close. This also would include each door or hatch through a pressure bulkhead, including any bulkhead that is specifically designed to function as a secondary pressure bulkhead under the prescribed failure conditions of 14 CFR part 25.

Other specific changes to § 25.783 are as follows:

Proposed Changes to § 25.783(a)

The formatting and portions of the text of proposed § 25.783(a) would be totally revised. The proposed text would describe the types of doors to which this section of the regulations is applicable, and would clarify the fact that the requirements are intended to apply to the unpressurized portions of flight as well as to pressurized flight.

Proposed § 25.783(a) also would provide the general design requirements for doors. These general design requirements are not substantively different from the requirements contained in the existing § 25.783. A reference to the locking requirements contained in § 25.607 ("Fasteners") would be included in paragraph § 25.783(a), since experience has shown that it is advisable to add this reference to ensure that these requirements are not overlooked during the door design process.

Proposed Changes to § 25.783(b)

Paragraph 25.783(b) would be revised to require safeguards against both inadvertent and deliberate opening of doors during flight. It would clarify the existing requirement that doors must be prevented from opening inadvertently (that is, not deliberately, and without forethought, consideration, or consultation) by persons on board the airplane during flight. The intent of this requirement is to protect both the passenger and the airplane from hazards resulting from the unintentional actions by persons on board.

In addition, the proposal would make it clear that the door must be safeguarded against the deliberate opening during flight by persons on board. The proposed text makes it clear that, for doors in pressurized compartments, it should not be possible to open the doors after takeoff, when the compartment is pressured

to a significant level. (During approach, takeoff, and landing when compartment differential pressure is lower, it is recognized that intentional opening may be possible; however, during these short phases of the flight, all passengers are expected to be seated with seat belts fastened.)

Further, for doors that can be opened under significant cabin pressure, or for doors in non-pressurized airplanes, the use of an auxiliary securing means, such as speed- or barometrically-activated devices, may be necessary. Past interpretations of the existing § 25.783(f) have resulted in this type of design requirement being applied to type certification projects. In addition, the proposed § 25.783(b) would require that, if auxiliary devices are used, they be designed so that no single failure or malfunction could prevent more than one exit from opening.

Proposed Changes to 25.783(c)

Proposed § 25.783(c) would restate the existing requirements of § 25.783(f) for a provision to prevent the airplane from becoming pressurized if the door is not fully closed, latched, and locked. The current requirement states:

> "External doors must have provisions to prevent the initiation of pressurization of the airplane to an unsafe level if the door is not fully closed and locked. . . "

However, this proposal would remove the phrase, ". . . <u>the initiation of</u> . . ." from this text because it is inconsistent and confusing with regard to a common method of preventing pressurization that employs vent doors. Mechanical vent doors allow the pressurization system to initiate and a small amount of pressure may exist as the air flows through the vents. The revised text would correct this inconsistency. It also would allow for certain types of doors that can safely and reliably act as their own

venting mechanism when not fully closed and latched, or that would automatically close and latch, as appropriate to the door design, before an unsafe level of pressure is reached. For these doors without an independent means, the assessment for a safe and reliable closing would include consideration of single failures and adverse conditions, such as debris in the doorway.

Proposed 25.783(c) also would provide a definitive criterion for the reliability level of the pressurization prevention system that is consistent with the interpretation of the general text of the existing rule, and that also is consistent with current industry practice for new designs. This proposed criterion is not intended to impose a new level of reliability for mechanical vent systems that is more stringent than that established by typical fail-safe designs. However, it would provide a definitive criterion for use in evaluating these vent systems or other systems that may interconnect with the airplane's pressurization system. A pressurization prevention means that would function with a high degree of reliability in spite of operator and flight crew errors, would be consistent with NTSB Safety Recommendation A-89-094, described previously, which recommends fail-safe features that account for conceivable human errors.

Proposed Changes to § 25.783(d)

Proposed § 25.783(d) would provide requirements for the detail design and fail-safe features of latching and locking mechanisms. Some of these design features are currently recommended in the existing FAA Advisory Circular (AC) 25.783-1 "Fuselage Doors, Hatches, and Exits," dated December 10, 1986; the proposed rule would make these features mandatory. One provision of this proposed requirement, which would require the removal of all power that could initiate the unlatching and

unlocking of the door during flight, is based on NTSB Safety Recommendation A-92-21, discussed previously.

For the most part, the detail design requirements for latches and locks contained in this proposed section are consistent with current industry practice, as applied to doors whose initial movement is not inward. However, the applicability of the proposed requirement would be extended to any door, unless it can be shown that unlatching would not be a hazard.

Proposed § 25.783(d) also would require that the latching mechanism be designed to eliminate forces that would tend to drive the latches to the open position. However, it is recognized that there may still be ratcheting forces that could progressively move the latches to the unlatched position. Therefore, the rule also would require that the latching system be designed such that the latches are positively secured without regard to the position of the locks.

A new provision in this proposed paragraph is the requirement for a fail-safe criterion for the locking system that would apply only to outward opening doors while under pressure. Since all the locks are usually designed as a single locking system, it is possible that single failures in the locking system could result in the unlocking of several or all the latches. Although the latches would continue to be held in the latched position by the latch system securing means, the FAA has determined that, for these more critical designs, during pressurized flight, single failures in the locking system should not unlock more latches than are needed to restrain the door.

Proposed Changes to § 25.783(e)

Proposed § 25.783(e) would require warning, caution, and advisory indications for doors. These requirements for indication are similar to the current provisions for indication of door status in this section, but provide additional features consistent with NTSB and ATA recommendations. The prescribed "improbable" level for an erroneous indication that the door is fully closed, latched, and locked is proposed to be the same as the requirement of the existing § 25.783(e), except that the applicability would be extended to each door, if unlatching of the door in flight could be a hazard.

Proposed § 25.783(e) also would require an aural warning before takeoff for each door, if opening of the door would not allow safe flight. The FAA has determined that this requirement is necessary, based on service history. It is intended that this system should function in a manner similar to the takeoff configuration warning systems required by § 25.703 ("Takeoff warning system").

Proposed § 25.783(e) also would require that there be a positive means to display indications and signals to the door operator. This proposed requirement is consistent with NTSB Safety Recommendation A-89-093, discussed previously.

Proposed Changes to § 25.783(f)

This proposal would revise § 25.783(f) to require a provision for direct visual inspections to determine that the door is fully closed, latched, and locked. This requirement is similar to that of the current § 25.783(b), which requires a means for direct visual inspection of the locking mechanism. However, this proposal would extend the requirements to apply to any door, irrespective of the direction of initial movement, if the unlatched door could be a hazard.

Proposed Changes to § 25.783(g)

This proposal would revise § 25.783(g) to provide relief from certain requirements of the current rule that are applicable to access panels not subject to pressurization and for which unlatching would not have a detrimental effect on safety. In addition, the proposal would provide relief from certain of the current requirements applicable to:

- maintenance doors that are not a hazard if unlatched; and
- removable emergency exits, because they are not used in normal operation and therefore not subjected to the same level of human error, abuse, and damage as other doors and hatches.

Proposed Changes to § 25.783(h)

Proposed § 25.783(h) would prescribe detail design features that a door would need to have if it were to be considered as a door that is "not a hazard" when this phrase is used in other paragraphs of § 25.783.

Proposed Changes to § 25.783(i)

The current requirements of § 25.783(i) that apply to the design of air stairs (integral stair installed in a passenger entry door that is qualified as a passenger emergency exit) would be removed from § 25.783 and placed in § 25.810 ("Emergency egress assist means and escape routes") as paragraph § 25.810(e), without change in text. The FAA considers that manufacturers, applicants, and others seeking compliance with rules would be better served by having these requirements located in the same section of the rules where other related requirements are found.

Proposed Changes to § 25.783(j)

The special requirement for lavatory doors contained in the current § 25.783(j) would be removed and set forth in a new § 25.820 ("Lavatory doors"), without change in text. The FAA considers that less confusion will be caused, and the regulated public will be better served, if all requirements pertaining to this particular subject are located in one separate place.

Other Proposed Changes

Several other provisions currently in § 25.783 would be deleted, since they duplicate the requirements applicable to emergency exit design that are contained in, or would be moved without substantive change to, other sections of part 25. The FAA considers that less confusion would be caused, and that the regulated public would be better served, if all requirements pertaining to a particular subject are located in one place. In this regard, the FAA is proposing the following specific changes:

§ 25.809(b) ("Emergency exit arrangement"): This paragraph would be revised by adding a new § 25.809(b)(3) to require that each emergency exit must be capable of being opened, when there is no fuselage deformation, "even though persons may be crowded against the door on the inside of the airplane." This specific requirement is currently a part of § 25.783(b), but is more appropriate as part of the emergency exit arrangement requirements of § 25.809.

§ 25.809(c): This paragraph would be revised to include the requirement that the means of opening emergency exits also must be marked so that it can be readily located and operated, even in darkness. This requirement is currently located

in § 25.783(b), but is more appropriate as part of the emergency exit arrangement requirements of § 25.809.

§ 25.809(f): This new paragraph would be added to require that the external door be located where persons using it will not be endangered by the propellers when appropriate operating procedures are used. This requirement currently is found in § 25.783(d), but is more applicable to the emergency exit arrangement requirements of § 25.809.

In addition, the following changes are proposed:

§ 25.807 ("Emergency exits"): The existing § 25.783 requires that passenger entry doors also meet the airworthiness standards required for emergency exits. In addition, the current Joint Airworthiness Requirement (JAR) 25.807, issued by the European JAA, requires that certain other fuselage doors, in addition to passenger entry doors, meet the same standards as emergency exits. Prior to the adoption of amendment 25-88 (61 FR 57956, November 8, 1996), 14 CFR part 25 also contained a requirement similar to that of JAR 25.807; however, that requirement was inadvertently omitted in the adoption of amendment 25-88. This proposed rule would correct this discrepancy by setting forth this requirement in a revised § 25.807(h), and by revising § 25.783 to refer to that section.

Specifically, the proposed § 25.807(h) would be revised to refer to "other exits" that must meet the applicable emergency exit requirements of §§ 25.809 through 25.813. Those exits include:

- each emergency exit in the passenger compartment in excess of the minimum number of required emergency exits;

- floor-level doors or exits that are accessible from the passenger compartment and larger than a Type II exit, but less than 46 inches wide; and
- ventral or tail cone passenger exits.

Related Advisory Material

The FAA also is proposing to issue a revised Advisory Circular 25-783-1A, "Fuselage Doors," which would set forth an acceptable means, but not the only means, for complying with the proposed revised regulations described in this notice. The document would provide guidance for showing compliance with structural and functional safety standards for doors and their operating systems. The availability of this proposed guidance information is announced elsewhere in this Federal Register.

Paperwork Reduction Act

In accordance with the Paperwork Reduction Act of 1995 [44 U.S.C. 3507(d)], the FAA had determined there are no requirements for information collection associated with this proposed rule.

Compatibility with ICAO Standards

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA determined that there are no ICAO Standards and Recommended Practices that correspond to this proposed regulation.

Regulatory Evaluation Summary

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic effect of regulatory changes on small entities. Third, the Office of Management and Budget directs agencies to assess the effects of regulatory changes on international trade. And fourth, the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of $100 million or more annually (adjusted for inflation). In conducting these analyses, the FAA has determined that this proposed rule: (1) would generate benefits that justify its costs and would not be "a significant regulatory action" as defined in section 3(f) of Executive Order 12866 and, therefore, is not subject to review by the Office of Management and Budget; (2) would not have a significant impact on a substantial number of small entities; (3) would not constitute a barrier to international trade; and (4) would not contain a significant intergovernmental or private sector mandate. These analyses, available in the docket, are summarized below. The FAA invites the public to provide comments and supporting data on the assumptions made in this evaluation. All comments received will be considered in the final regulatory evaluation.

Initial Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation." To achieve that principle, the Act requires agencies to solicit and consider flexible regulatory proposals and to explain the rationale for their actions. The Act covers a wide-range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions.

Agencies must perform a review to determine whether a proposed rule will have a significant economic impact on a substantial number of small entities. If the determination is that it will, the agency must prepare a regulatory flexibility analysis as described in the Act.

However, if an agency determines that a proposed or final rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the 1980 Act provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

International Trade Impact Assessment

The provisions of this proposed rule would have little or no impact on trade for U.S. firms doing business in foreign countries and foreign firms doing business in the United States.

Federalism Implications

The regulation proposed herein would not have a substantial direct effect on the States, on the relationship between the national Government and the states, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this proposal would not have sufficient federalism implications to warrant the preparation of a federalism assessment.

Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (the Act), codified in 2 U.S.C. 1501-1571, requires each Federal agency, to the extent permitted by law, to prepare a written assessment of the effects of any Federal mandate in a proposed or final agency rule that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more (adjusted annually for inflation) in any one year. Section 204(a) of the Act, 2 U.S.C. 1534(a), requires the Federal agency to develop an effective process to permit timely input by elected officers (or their designees) of State, local, and tribal governments on a proposed "significant intergovernmental mandate." A "significant intergovernmental mandate" under the Act is any provision in a Federal agency regulation that will impose an enforceable duty upon State, local, and tribal governments, in the aggregate, of $100 million (adjusted annually for inflation) in any one year. Section 203 of the Act, 2 U.S.C. 1533, which supplements section 204(a), provides that before establishing any regulatory requirements that might significantly or uniquely affect small governments, the agency shall have developed a plan that, among other things, provides for notice to potentially affected small

governments, if any, and for a meaningful and timely opportunity to provide input in the development of regulatory proposals.

This proposed rule does not contain a Federal intergovernmental or private sector mandate that exceeds $100 million in any one year.

Environmental Analysis

FAA Order 1050.1D defines FAA actions that may be categorically excluded from preparation of a National Environmental Policy Act (NEPA) environmental assessment or environmental impact statement. In accordance with FAA Order 1050.1D, appendix 4, paragraph 4(j), this rulemaking qualifies for a categorical exclusion.

Energy Impact

The energy impact of the proposed rule has been assessed in accordance with the Energy Policy and Conservation Act (EPCA) and Public Law 94-163, as amended (42 U.S.C. 6362). It has been determined that it is not a major regulatory action under the provisions of the EPCA.

Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the Administrator, when modifying regulations in Title 14 of the CFR in a manner affecting intrastate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish such regulatory distinctions as he or she considers appropriate. Because this proposed rule would apply to the certification of future designs of transport category airplanes and their subsequent operation, it could, if adopted, affect intrastate aviation in Alaska. The FAA therefore specifically requests comments on whether there is justification for applying the proposed rule differently to intrastate operations in Alaska.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Recording and Recordkeeping Requirements.

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend part 25 of Title 14, Code of Federal Regulations, as follows:

PART 25--AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

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

Authority: 49 U.S.C. 106(g), 40113, 44701-44702, and 44704.

2. Amend § 25.783 by revising the title and text to read as follows:

§ 25.783 Fuselage doors.

(a) General.. This section applies to fuselage doors, which includes all doors, hatches, openable windows, access panels, covers, etc., on the exterior of the fuselage that do not require the use of tools to open or close. This also applies to each door or hatch through a pressure bulkhead, including any bulkhead that is specifically designed to function as a secondary bulkhead under the prescribed failure conditions of part 25. These doors must meet the requirements of this section, taking into account both pressurized and unpressurized flight, and must be designed as follows:

(1) Each door must have means to safeguard against opening in flight as a result of mechanical failure, or failure of each single structural element.

(2) Each door that could be a hazard if it unlatches must be designed so that unlatching during pressurized and unpressurized flight from the fully closed, latched, and locked condition is extremely improbable. This must be shown by safety analysis.

(3) Each element of each door operating system must be designed or, where impracticable, distinctively and permanently marked, to minimize the probability of incorrect assembly and adjustment that could result in a malfunction.

(4) All sources of power that could initiate unlocking or unlatching of each door must be automatically isolated from the latching and locking systems prior to flight and it must not be possible to restore power to the door during flight.

(5) Each removable bolt, screw, nut, pin, or other removable fastener must meet the locking requirements of § 25.607.

(6) Certain doors, as specified by § 25.807(h), must also meet the applicable requirements of §§ 25.809 through 25.813 for emergency exits.

(b) Opening by persons. There must be a means to safeguard each door against opening during flight due to inadvertent action by persons. In addition, design precautions must be taken to minimize the possibility for a person to open a door intentionally during flight. If these precautions include the use of auxiliary devices, those devices and their controlling systems must be designed so that:

(i) no single failure will prevent more than one exit from being opened, and

(ii) failures that would prevent opening of the exit after landing are improbable.

(c) Pressurization prevention means. There must be a provision to prevent pressurization of the airplane to an unsafe level if any door subject to pressurization is not fully closed, latched, and locked.

(1) The provision must be designed to function after any single failure, or after any combination of failures not shown to be extremely improbable.

(2) Doors that meet the conditions described in § 25.783(h) are not required to have a dedicated pressurization prevention means if, from every possible position of the door, it will remain open to the extent that it prevents pressurization, or safely close and latch as pressurization takes place. This must also be shown with each single failure and malfunction except that:

(i) with failures or malfunctions in the latching mechanism, it need not latch after closing, and

(ii) with jamming as a result of mechanical failure or blocking debris, the door need not close and latch if it can be shown that the pressurization loads on the jammed door or mechanism would not result in an unsafe condition.

(d) Latching and locking. The latching and locking mechanisms must be designed as follows:

(1) There must be a provision to latch each door.

(2) The latches and their operating mechanism must be designed so that, under all airplane flight and ground loading conditions, with the door latched, there is no force or torque tending to unlatch the latches. In addition, the latching system must include a means to secure the latches in the latched position. This means must be independent of the locking system.

(3) Each door subject to pressurization, and for which the initial opening movement is not inward, must --

(i) have an individual lock for each latch,

(ii) have the lock located as close as practicable to the latch, and

(iii) be designed so that, during pressurized flight, no single failure in the locking system would prevent the locks from restraining the latches as necessary to secure the door.

(4) Each door for which the initial opening movement is inward, and unlatching of the door could result in a hazard, must have a locking means to prevent the latches from becoming disengaged. The locking means must ensure sufficient latching to prevent opening of the door even with a single failure of the latching mechanism.

(5) Each door for which unlatching would not result in a hazard is not required to have a locking mechanism.

(6) It must not be possible to position the lock in the locked position if the latch and the latching mechanism are not in the latched position.

(7) It must not be possible to unlatch the latches with the locks in the locked position. Locks must be designed to withstand the limit loads resulting from --

(i) the maximum operator effort when the latches are operated manually;

(ii) the powered latch actuators, if installed; and

(iii) the relative motion between the latch and the structural counterpart.

(e) Warning, caution, and advisory indications. Doors must be provided with the following indications:

(1) There must be a positive means to indicate at the door operator's station for each door that all required operations to close, latch, and lock the door have been completed.

(2) There must be a positive means clearly visible from the operator station for each door to indicate if the door is not fully closed, latched, and locked for each door that could be a hazard if unlatched.

(3) There must be a visual means on the flight deck to signal the pilots if any door is not fully closed, latched, and locked. The means must be designed such that any failure or combination of failures that would result in an erroneous closed, latched, and locked indication is improbable for —

(i) each door that is subject to pressurization and for which the initial opening movement is not inward, or

(ii) each door that could be a hazard if unlatched.

(4) There must be an aural warning to the pilots prior to or during the initial portion of takeoff roll if any door is not fully closed, latched, and locked, and its opening would prevent a safe takeoff and return to landing.

(f) Visual inspection provision. Each door for which unlatching could be a hazard must have a provision for direct visual inspection to determine, without ambiguity, if the door is fully closed, latched, and locked. The provision must be permanent and discernible under operational lighting conditions, or by means of a flashlight or equivalent light source.

(g) Certain maintenance doors, removable emergency exits, and access panels. Some doors not normally opened except for maintenance purposes or emergency evacuation and some access panels need not comply with certain paragraphs of this section as follows:

(1) Access panels that are not subject to cabin pressurization and would not be a hazard if unlatched during flight need not comply with paragraphs (a) through (f) of this section, but must have a means to prevent inadvertent opening during flight.

(2) Inward-opening removable emergency exits that are not normally removed, except for maintenance purposes or emergency evacuation, and flight deck-openable windows need not comply with paragraphs (c) and (f) of this section.

(3) Maintenance doors that meet the conditions of § 25.783(h), and for which a placard is provided limiting use to maintenance access, need not comply with paragraphs (c) and (f) of this section.

(h) Doors that are not a hazard. For the purposes of this section, a door is considered not to be a hazard in the unlatched condition during flight, provided it can be shown to meet all of the following conditions:

(1) Doors in pressurized compartments would remain in the fully closed position if not restrained by the latches when subject to a pressure greater than ½ psi. Opening by persons, either inadvertently or intentionally, need not be considered in making this determination.

(2) The door would remain inside the airplane or remain attached to the airplane if it opens either in pressurized or unpressurized portions of the flight. This determination must include the consideration of inadvertent and intentional opening by persons during either pressurized or unpressurized portions of the flight.

(3) The disengagement of the latches during flight would not allow depressurization of the cabin to an unsafe level. This safety assessment must include the physiological effects on the occupants.

(4) The open door during flight would not create aerodynamic interference that could preclude safe flight and landing.

(5) The airplane would meet the structural design requirements with the door open. This assessment must include the aeroelastic stability requirements of § 25.629, as well as the strength requirements of this subpart.

(6) The unlatching or opening of the door must not preclude safe flight and landing as a result of interaction with other systems or structures.

3. Amend §25.807 by revising paragraph (h) to read as follows:

§ 25.807 Emergency exits.

* * * * *

(h) Other exits. The following exits also must meet the applicable emergency exit requirements of §§ 25.809 through 25.813:

(1) Each emergency exit in the passenger compartment in excess of the minimum number of required emergency exits.

(2) Any other floor-level door or exit that is accessible from the passenger compartment and is as large or larger than a Type II exit, but less than 46 inches wide.

(3) Any other ventral or tail cone passenger exit.

4. Amend § 25.809 by adding a new paragraph (b)(3), and by revising paragraphs (c) and (f) to read as follows:

§ 25.809 Emergency exit arrangement.

* * * * *

(b) * * * * *

(3) Even though persons may be crowded against the door on the inside of the airplane.

(c) The means of opening emergency exits must be simple and obvious; may not require exceptional effort; and must be arranged and marked so that it can be readily located and operated, even in darkness. Internal exit-opening means involving sequence operations (such as operation of two handles or latches, or the release of safety catches) may be used for flight crew emergency exits if it can be

reasonably established that these means are simple and obvious to crewmembers trained in their use.

* * * * *

(f) Each door must be located where persons using them will not be endangered by the propellers when appropriate operating procedures are used.

* * * * *

5. Amend § 25.810 by adding a new paragraph (e), as follows:

§ 25.810 Emergency egress assist means and escape routes.

* * * * *

(e) If an integral stair is installed in a passenger entry door that is qualified as a passenger emergency exit, the stair must be designed so that, under the following conditions, the effectiveness of passenger emergency egress will not be impaired:

(1) The door, integral stair, and operating mechanism have been subjected to the inertia forces specified in § 25.561(b)(3), acting separately relative to the surrounding structure.

(2) The airplane is in the normal ground attitude and in each of the attitudes corresponding to collapse of one or more legs of the landing gear.

6. Add a new § 25.820 to read as follows:

§ 25.820 Lavatory doors.

All lavatory doors must be designed to preclude anyone from becoming trapped inside the lavatory. If a locking mechanism is installed, it must be capable of being unlocked from the outside without the aid of special tools.

Issued in Washington, D.C., on

Aircraft Certification Service

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: FUSELAGE DOORS	**Date:** DRAFT Feb 1,2000 Revision 6	**AC No: 25.783-1A**
	Initiated By: ANM-110	**Change:**

WORKING DRAFT -- NOT FOR PUBLIC RELEASE.

1. **PURPOSE.** This Advisory Circular (AC) describes an acceptable means for showing compliance with the requirements of § 25.783, "Fuselage doors," and other applicable sections of Title 14, Code of Federal Regulations (CFR), part 25, commonly referred to as Part 25 of the Federal Aviation Regulations (FAR). Part 25 contains the airworthiness standards applicable to transport category airplanes. The means of compliance described in this document is intended to provide guidance to supplement the engineering and operational judgment that must form the basis of any compliance findings relative to the structural and functional safety standards for doors and their operating systems.

The guidance provided in this document is directed to airplane manufacturers, modifiers, foreign regulatory authorities, and Federal Aviation Administration transport airplane type certification engineers and their designees.

Like all advisory circular material, this AC is not, in itself, mandatory, and does not constitute a regulation. It is issued to describe an acceptable means, but not the only means, for demonstrating compliance with the requirements for transport category airplanes. Terms such as "shall" and "must" are used only in the sense of ensuring applicability of this particular method of compliance when the acceptable method of compliance described in this document is used.

2. **CANCELLATION**. Advisory Circular 25.783-1, "Fuselage Doors, Hatches, and Exits," dated 12/10/86, is canceled.

3. **RELATED SECTIONS OF FEDERAL AVIATION REGULATIONS.**

§ 25.571, "Damage-tolerance and fatigue evaluation of structure"

§ 25.607, "Fasteners"
§ 25.703, "Takeoff warning system"
§ 25.783, "Fuselage doors"
§ 25.809, "Emergency exit arrangement"
§ 25.813, "Emergency exit access"

4. **DEFINITIONS**. Inconsistent or inaccurate use of terms may lead to the installation of doors and hatches that do not fully meet the safety objectives of the regulations. To ensure that such installations fully comply with the regulations, the following definitions should be used when showing compliance with § 25.783:

a. Door includes all doors, hatches, openable windows, access panels, covers, etc., on the exterior of the fuselage that do not require the use of tools to open or close. This also includes each door or hatch through a pressure bulkhead, including any bulkhead that is specifically designed to function as a secondary bulkhead under the prescribed failure conditions of Part 25 of the regulations.

b. Initial opening movement refers to that door movement, caused by operation of a handle or other door control mechanism, which is required to place the door in a position free of structure that would interfere with continued opening of the door.

c. Inward means having a directional component of movement that is inward with respect to the mean (pressure) plane of the body cutout.

d. Closed means that the door has been placed within the doorframe in such a position that the latches can be operated to the "latched" condition. Fully closed means that the door is placed within the doorframe in the position it will occupy when the latches are in the latched condition.

e. Latches are movable mechanical elements that, when engaged, prevent the door from opening.

f. Latched means that the latches are engaged with their structural counterparts and held in position by the latch operating mechanism.

g. Latching system means the latch operating system and the latches.

h. Locks are mechanical elements, in addition to the latch operating mechanism, that monitor the latch positions and, when engaged, prevent latches from becoming disengaged.

i. Locked means that the locks are engaged.

j. Locking system means the lock operating system and the locks.

k. Stops are fixed structural elements on the door and doorframe that, when in contact, limit the directions in which the door is free to move.

l. Exit is a door designed to allow egress from the airplane.

m. Emergency exit is an exit designated for use in an emergency evacuation.

n. Flight refers to that period of time from the start of takeoff roll until the airplane comes to rest after landing.

o. Door operator's station is the location(s) where the door closing, latching, and locking operations are performed. {note: we need to make it clear that these are locations for an individual door, not an operator station form multiple or all doors. Suggestions?)

p. Inadvertent action by persons means an act committed without forethought, consideration, or consultation.

5. **BACKGROUND.**

a. There is a history of incidents and accidents in which doors, fitted in pressurized airplanes, have opened inadvertently during pressurized and

unpressurized flight. Some of these inadvertent openings have consequently resulted in fatal accidents. After one fatal accident that occurred in 1974, the FAA and industry representatives formed a design review team to examine the current regulatory requirements for doors to determine if those regulations were adequate to ensure safety. The team's review and eventual recommendations led to the FAA issuing Amendment 25-54 to 14 CFR part 25 in 1980, which significantly improved the safety standards for doors installed on transport category airplanes. Included as part of Amendment 25-54 was § 25.783, "Doors," which provides the airworthiness standards for doors installed on transport category airplanes. Although there have been additional minor revisions to § 25.783 subsequent to the issuance of amendment 25-54, the safety standards for doors have remained essentially the same since 1980.

b. In spite of the improved standards brought about in 1980, there have continued to be safety problems, especially with regard to cargo doors. Cargo doors are often operated by persons having little formal instruction in their operation. Sometimes the operator is required to carry out several actions in sequence to complete the door opening and closing operations. Failure to complete all sequences during closure can have serious consequences. Service history shows that several incidents of doors opening during flight have been attributed to the failure of the operator to complete the door closure and locking sequence. Other incidents have been attributable to incorrect adjustment of the door mechanism, or failure of a vital part.

c. Experience also has shown that, in some cases, the flight deck indication system has not been reliable. In other instances, the door indication system was verified to be indicating correctly, but the flight crew, for unknown reasons, was not alerted to the unsafe condition. A reliable indication of door status on the flight deck is particularly important on airplanes used in operations where the flight crew does not have an independent means readily available to verify that the doors are properly secured.

d. On some airplanes, large cargo doors form part of the basic fuselage structure, so that, unless the door is properly closed and latched, the basic airframe structure is unable to carry the design aerodynamic and inertial loads. Large cargo doors also have the potential for creating control problems when an open door acts as an aerodynamic surface. In such cases, failure to secure the door properly could have catastrophic results, even when the airplane is unpressurized.

e. After two accidents occurred in 1989 that were related to the failure of cargo doors on transport category airplanes, the FAA chartered the Air Transport Association (ATA) of America to study the door design and operational issues again for the purpose of recommending improvements. The ATA concluded its study in 1991 and made recommendations to the FAA for improving the design standards of doors. Those recommendations and additional recommendations from the National Transportation Safety Board were considered in the development of improved standards for doors adopted by Amendment 25-XXX.

6. **DISCUSSION OF THE CURRENT REQUIREMENTS.** Service history has shown that, to prevent doors from becoming a hazard by opening during flight, it is necessary to provide multiple layers of protection against failures, malfunctions, and human error. Section 25.783 addresses these multiple layers of protection by requiring:

- a latching system,
- a locking system,
- indication systems, and
- a pressure prevention means.

These features provide a high degree of tolerance to failures, malfunctions, and human error. Section 25.783 intends that the latching system be designed so that it is inherently or specifically restrained from being back-driven from the latches; but even so, the latches are designed to eliminate, as much as possible, all forces from the latch side that would tend to unlatch the latches. In addition to these features that prevent the latches from inadvertently opening, a separate locking system is required for doors that could be a hazard if they become unlatched. Notwithstanding these safety features, it could still be possible for the door operator to make errors in closing the door, or for mechanical failures to occur during or after closing; therefore, an indicating system is required that will signal to the flight crew if the door is not fully closed, latched, and locked. However, since it is still possible for the indication to be missed or unheeded, a separate system is required that prevents pressurization of the airplane to an unsafe level if the door is not fully closed, latched, and locked.

The following material restates the requirements of § 25.783 in italicized text and, immediately following, provides a discussion of acceptable compliance criteria.

a. General Design Considerations.

(1) ***Each door must have means to safeguard against opening in flight as a result of mechanical failure, or failure of each single structural element.***

Failures that should be considered when safeguarding the door against opening as a result of mechanical failure or failure of a single structural element, include those caused by:

- wear;
- excessive backlash;
- excessive friction;
- jamming;
- incorrect assembly;
- incorrect adjustment;
- parts becoming loose, disconnected, or unfastened; and
- parts breaking, fracturing, bending, or flexing beyond the extent intended.

(2) ***Each door that could be a hazard if unlatched must be designed so that unlatching during pressurized and unpressurized flight from the fully closed, latched, and locked condition is extremely improbable. This must be shown by safety analysis.***

All doors should incorporate features in the latching mechanism that provide a positive means to prevent the door from opening as a result of:

- vibrations,
- structural loads and deflections,
- positive and negative pressure loads, positive and negative "g" loads,
- aerodynamic loads, etc.

The means should be effective throughout the approved operating envelope of the airplane, including the unpressurized portions of flight.

The safety assessment required by this regulation may be a qualitative or quantitative analysis, or a combination, as appropriate to the design. In evaluating a failure condition that results in total failure or inadvertent opening of the door, all contributing events should be considered, including:

- failure of the door and door supporting structure,
- flexibility in structures and linkages,
- failure of the operating system,
- erroneous signals from the door indication systems, and
- likely errors in operating and maintaining the door.

(3) ***Each element of each door operating system must be designed or, where impracticable, distinctively and permanently marked, to minimize the probability of incorrect assembly and adjustment that could result in a malfunction.***

Experience has shown that the level of protection against mechanical failure can be significantly improved by careful attention to detail design. Therefore, the following points should be taken into account:

(a) To minimize the risk of incorrect assembly and adjustment, parts should be designed to prevent incorrect assembly if, as a result of such incorrect assembly, door functioning would be adversely affected. "Adverse effects" could be such things as preventing or impeding the opening of the door during an emergency, or reducing the capability of the door to remain closed. If such designs are impracticable and marking is used instead, the marking should remain clearly identifiable during service. In this respect, markings could be made using material such as permanent ink, provided it is resistant to typical solvents, lubricants, and other materials used in normal maintenance operations.

(b) To minimize the risk of the door operating mechanism being incorrectly adjusted in service, adjustment points that are intended for "in-service" use only should be clearly identified, and limited to a minimum number consistent with adequate adjustment capability. Any points provided solely to facilitate adjustment at the initial build and not intended for subsequent use, should be made non-adjustable after initial build, or should be highlighted in the maintenance manual as a part of the door mechanism that is not intended to be adjusted.

(4) ***All sources of power that could initiate unlocking or unlatching of each door must be automatically isolated from the latching and locking systems prior to flight and it must not be possible to restore power to them during flight.***

For doors that use electrical, hydraulic, or pneumatic power to initiate unlocking or unlatching, those power sources must be automatically isolated from the latching and locking systems before flight, and it should not be possible to restore power to them during flight. It is particularly important for doors with powered latches or locks to have all power removed that could power these systems or that could energize control circuits to these systems in the event of electrical short circuits. This does not include power to the door indicating system, auxiliary securing devices if

installed, or other systems not related to door operation. Power to those systems should not be sufficient to cause unlocking or unlatching unless each failure condition that could result in energizing the latching and locking systems is extremely improbable.

(5) ***Each removable bolt, screw, nut, pin, or other removable fastener must meet the locking requirements of § 25.607 ["Fasteners"].***

Refer to FAA Advisory Circular 20-71, "Dual Locking Devices on Fasteners," dated 12/8/70, for guidance on complying with § 25.607.

(6) ***Certain fuselage doors, as specified by § 25.807(h), must also meet the applicable requirements of §§ 25.809 through 25.813 for emergency exits.***

Refer to FAA Advisory Circular 25.XXX, "_____," dated _____, for guidance pertaining to emergency exits.

b. Opening by persons.

(1) ***There must be a means to safeguard each door against opening during flight due to inadvertent action by persons.***

The door should have inherent design features that achieve this objective. It is not considered acceptable to rely solely on cabin pressure to prevent inadvertent opening of doors during flight, because there have been instances where doors have opened during unpressurized flight, such as during landing. Therefore, all doors should incorporate features to prevent the door from being opened inadvertently by persons on board.

(2) ***In addition, precautions must be taken to minimize the possibility for a person to open a door intentionally during flight. If these precautions include the use of auxiliary devices, those devices must be designed so that a single failure will not prevent more than one exit from being opened.***

The intentional opening of a door by persons on board while the airplane is in flight should be considered. This rule is intended to protect the aircraft and passengers, but not necessarily the person who intentionally tries to open the door. Suitable design precautions should therefore be taken; however, the precautions should not compromise the ability to open an emergency exit in an emergency evacuation. The following precautions should be considered:

(a) For doors in pressurized compartments: It should not normally be possible to open the door when the compartment differential pressure is above 2 psi. The ability to open the door will depend on the door operating mechanism and the handle design, location, and operating force. Operating forces in excess of 300 pounds should be considered sufficient to prevent the door from being opened. During approach, takeoff, and landing, when compartment differential pressure is lower, it is recognized that intentional opening may be possible; however, these phases are brief and all passengers are expected to be seated with seat belts fastened.

(b) For doors that cannot meet the guidance of paragraph 6.b.(2)(a), above, and for doors in non-pressurized airplanes: The use of auxiliary devices (for example, a speed-activated or barometrically-activated means) to safeguard the door from opening should be considered. The need for such auxiliary devices should depend upon the consequences to the airplane and other occupants if the door is opened in flight.

(c) If auxiliary devices are installed on emergency exits: The failure of an auxiliary device should normally result in an unsecured position of the device. Failures of the device that would prevent opening of the exit after landing should be improbable. Where auxiliary devices are controlled by a central system or other more complex systems, a single failure criterion for opening may not be sufficient. The criteria for failure of the auxiliary devices to open after landing should include consideration of single failures and all failure conditions that ~~they~~ are not improbable.

c. Pressurization prevention means.

(1) ***There must be a provision to prevent pressurization of the airplane to an unsafe level if any door subject to pressurization is not fully closed, latched, and locked. The provision must be designed to function after any single failure, or after any combination of failures not shown to be extremely improbable.***

(a) The provisions for preventing pressurization must monitor the closed, latched, and locked condition of the door. If more than one lock system is used, each lock system must be monitored. Examples of such provisions are vent panels and pressurization inhibiting circuits. Pressurization to an unsafe level is considered to be prevented when the compartment differential pressure is kept below 1/2 psi. These systems are not intended to function to depressurize the

airplane once the fully closed, latched, and locked condition is established and pressurization is initiated.

(b) If a vent panel is used, it should be designed so that, in normal operation or with a single failure in the operating linkage, the vent panel cannot be closed until the door is latched and locked. The vent panel linkage should monitor the position of each door lock.

(c) If automatic control of the cabin pressurization system is used as a means to prevent pressurization, the control system should monitor each lock. Because inadvertent depressurization at altitude can be hazardous to the occupants, this control system should be considered in showing compliance with the applicable pressurization system reliability requirements. Normally, such systems should be automatically disconnected from the airplane's pressurization system after the airplane is airborne, provided no prior unsafe condition was detected.

(d) It should not be possible to override the pressurization prevention system unless a procedure is defined in the Master Minimum Equipment List (MMEL) that confirms a fully closed, latched, and locked condition. In order to prevent the override procedure from becoming routine, the override condition should not be achievable by actions solely on the flight deck, and should be automatically reset at each door operational cycle.

(2) Doors that meet the conditions described in § 25.783(h) are not required to have a dedicated pressurization prevention means if, from every possible position of the door, it will remain open to the extent that it prevents pressurization, or close and latch as pressurization takes place. This must also be shown with each single failure or malfunction except that:

(i)) with failures or malfunctions in the latching mechanism, it need not latch after closing, and

(ii)jamming as a result of mechanical failure or blocking debris, the door need not close and latch if it can be shown that the pressurization loads on the jammed door or mechanism would not result in an unsafe condition.

(a) As specified in § 25.783(d)(5), each door for which unlatching would not result in a hazard is not required to have a locking mechanism; those doors also may not be required to have a dedicated pressurization prevention means. However, this should be determined by demonstrating that an unsafe level of pressurization cannot be achieved for each position that the door may take during closure, including those positions that may result from single failures or jams.

- Excluding jamming and excluding failures and malfunctions in the latching system, for every possible position of the door, it must either remain open to the extent that it prevents pressurization, or safely close and latch as pressurization takes place.

- With single failures of the latching system or malfunctions in the latching system the door may not necessarily be capable of latching, but it should either remain open to the extent that it prevents pressurization, or safely move to the closed position as pressurization takes place; and

- With jamming as a result of mechanical failure in the latching system or blocking debris, the pressurization loads on the jammed door or mechanism may not result in damage to the door or airframe that could be detrimental to safe flight (both the immediate flight or future flights). In this regard, consideration should be given to jams or non-frangible debris that could hold the door open just enough to still allow pressurization, and then break loose in flight after full pressurization is reached.

d. Latching and locking

(1) ***There must be a provision to latch each door.*** Latches are movable mechanical elements that, when engaged, prevent the door from opening.

(a) The definitions of latches and locks are redefined as of amendment 25-xxx, particularly with regard to mechanical and structural elements of inward-opening plug doors. In this regard, fixed stops are not considered latches. The movable elements that hold the door in position relative to the fixed stops are considered latches. These movable elements prevent the door from opening and will support some loads in certain flight conditions, particularly when the airplane is unpressurized.

(b) For all doors, § 25.783(d)(2) requires that the latching system employ a securing means other than the locking system. The separate locking system may not be necessary for certain inward-opening plug doors [see § 25.783(d)(5)].

(2) ***The latches and their operating mechanism must be designed so that, under all airplane flight and ground loading conditions, with the door latched, there is no force or torque tending to unlatch the latches. In addition, the latching system must include a means to secure the latches in the latched position. This means must be independent of the locking system.***

The latches of doors for which the initial opening movement is outward are typically subject to vibrations; structural loads and deflections; positive and negative pressure loads; positive and negative "g" loads; aerodynamic loads; etc. The latches of doors for which the initial opening movement is inward typically share some of these same types of loads with fixed stops. Doors for which the initial opening movement is inward tend to be resistant to opening when the aircraft is pressurized since a component of the pressure load tends to hold the door closed. In order for a design to be classified as having an inward initial opening movement, it should be shown that the provisions provided to guide the door inward have sufficient rigidity and strength to fulfil their function with a pressure of at least 2 psi applied to the door.

(a) The design of the latch should be such that, with the latch disconnected from its operating mechanism, the net reaction forces on the latch should not tend to unlatch the latch during both pressurized and unpressurized flight throughout the approved flight envelope. The effects of possible friction in resisting the forces on the latch should be ignored when considering reaction forces tending to unlatch the door. The effects of distortion of the latch and corresponding structural attachments should be taken into account in this determination. Any latch element for which "g" loads could result in an unlatching force should be designed to minimize such forces.

(b) Even though the principal back-driving forces should be eliminated by design, it is recognized that there may still be ratcheting forces that could progressively move the latches to the unlatched position. Therefore, each latch should be positively secured in the latched position by its operating mechanism, which should be effective throughout the approved flight envelope. The location of the operating system securing means will depend on the rigidity of the system and the tendency for any forces (such as ratcheting) at one latch to unlatch other latches.

(c) Overcenter features in the latching mechanism are considered to be an acceptable securing means, provided that an effective retaining feature that functions automatically to prevent back-driving is incorporated. If the

design of the latch is such that it could be subject to ratcheting loads that might tend to unlatch it, the securing means should be adequate to resist such loads.

(d) In those designs that use the latch to operate an electrical switch, a back-driving effect of the switch on the latch is permissible, provided that the extent of any possible movement of the switch:

- is insufficient to unlatch it, and
- will not result in the latch being subjected to any other force or torque tending to unlatch it.

(e) The latch securing means must be independent of the locking means. However, the latching and locking functions may be fulfilled by a single operating means, provided that it is not possible to back-drive the locks via the latch mechanism when the door is locked.

(3) ***Each door subject to pressurization, and for which the initial opening movement is not inward, must have an individual lock for each latch. The lock must be located as close as practicable to the latch. The door must be designed so that, in pressurized flight, no single failure in the locking system would prevent the locks from restraining the latches as necessary to secure the door.***

(a) To safeguard doors subject to pressurization and for which the initial opening movement is not inward, each latch must have an individual lock. The lock should directly lock the latch. In this regard, the lock should be located directly at the latch to ensure that, in the event of a single failure in the latch operating mechanism, the lock would continue to restrain the latch in the latched position. Even in those cases where the lock cannot be located directly at the latch, the same objective should be achieved. In some cases, a pair of integrally-connected latches may be treated as a single latch with respect to the requirement for a lock, provided that:

1 the lock reliably monitors the position of at least one of the load-carrying elements of the latch; and

2 with any one latch element missing, the airplane can meet the full requirements of Part 25 as they apply to the unfailed airplane; and

3 with the pair disengaged, the airplane can achieve safe flight and landing, and meet the damage tolerance requirements of § 25.571 ("Damage-tolerance and fatigue evaluation of structure").

(b) In some designs, more latches are provided than necessary to meet the minimum design requirements. The single failure requirement for the locking system is intended to ensure that the number and combination of latches necessary to secure the door will remain restrained by the locking mechanism. Only those latches needed to meet the minimum design requirements need to remain restrained after the single failure.

(c) In meeting this requirement, the indirect locking provided through the latch system by the locks at other latches may be considered. In this case, the locking system and the latching system between the locked latch and the unlocked latch should be designed to withstand the maximum design loads discussed below in paragraph 6.d.(7) of this AC, below, as appropriate to pressurized flight.

(4) ***Each door for which the initial opening movement is inward and unlatching of the door could result in a hazard, must have a locking means to prevent the latches from becoming disengaged. The locking means must ensure sufficient latching to prevent opening of the door even with a single failure in the latching mechanism.***

On these doors, the locking means should monitor the latch securing means, but need not directly monitor and lock each latch. Additionally, the locking means could be located such that all latches are locked by locking the latching mechanism. With any single failure in the latching mechanism, the means must still lock a sufficient number of latches to ensure that the door remains safely latched.

(5) ***Each door for which unlatching would not result in a hazard is not required to have a locking mechanism.***

See paragraph 6.h. of this AC, below, for a description of the kinds of doors for which unlatching is considered not to result in a safety hazard.

(6) ***It must not be possible to position the lock in the locked position if the latch and the latching mechanism are not in the latched position.***

The lock should be an effective monitor of the position of the latch such that, if any latch is unlatched, the complete locking system cannot be moved to the locked position. Although an overcenter feature may be an adequate means of securing the latching mechanism, it is not considered to be the locking means for the latches.

(7) ***It must not be possible to unlatch the latches with the locks in the locked position. Locks must be designed to withstand the limit loads imposed by the maximum forces that can be developed when the latches are operated manually; by the powered latch actuators, if installed; and by any loads developed by relative motion between the latch and the structural counterpart.***

Although the locks are not the primary means of keeping the latches engaged, they must have sufficient strength to withstand any loads likely to be imposed during all approved modes of door operation. The operating handle loads on manually-operated doors should be based on a rational human factors evaluation. However, handle forces in excess of 300 pounds need not be considered. The loads imposed by the normal powered latch actuators are generally predictable; however, loads imposed by alternate drive systems are not. For this reason, the locks should have sufficient strength to react to the stall forces of the latch drive system. Load-limiting devices should be installed in any alternative drive system for the latches in order to protect the latches and the locks from overload conditions. If the design of the latch is such that it could be subject to ratcheting loads that might tend to unlatch it, the locks should be adequate to resist such loads with the latch operating system disconnected from the latch.

e. Warning, caution, and advisory indications.

(1) ***There must be a positive means to indicate at the operator's station for each door that all required operations to close, latch, and lock the door have been completed.***

In order to minimize the probability of incomplete door operations, it should be possible to perform all operations for each door at one station. If there is more than one operator's station for a single door, appropriate indications should be provided at each station. The positive means to indicate at the door operator's station that all required operations have been completed are such things as final handle positions or indicating lights. This requirement is not intended to preclude or require a single station for multiple doors.

(2) ***There must be a positive means visible from the door operator's station for each door to indicate if the door is not fully closed, latched, and locked for each door that could be a hazard if unlatched.***

A single indication that directly monitors the door in the closed, latched, and locked conditions should be provided, unless the door operator has a visual indication that the door is fully closed, latched, and locked. This indication should be obvious to the door operator. For example, a vent door or indicator light that monitors the door locks and is located at the door operator's station may be sufficient.

(3) ***There must be a visual means on the flight deck to signal the pilots if any door is not fully closed, latched, and locked. The means must be designed such that any failure or combination of failures that would result in an erroneous closed, latched, and locked indication is improbable for each door that is subject to pressurization and for which the initial opening movement is not inward; or for each door that could be a hazard if unlatched.***

The visual means may be a simple amber light or it may need to be a red warning light tied to the master warning system, depending on the criticality of the door. The door closed, latched, and locked functions must be monitored, but only one indicator is needed to signal that the door is in the closed, latched, and locked condition. Indications should be reliable to ensure that they remain credible. The probability of erroneous closed, latched, and locked indication should be no greater than 0.00001.

- for each door subject to pressurization and for which the initial opening movement is not inward; and
- for each door that could be a hazard if unlatched.

(4) ***There must be an aural warning to the pilots prior to or during the initial portion of takeoff roll if any door is not fully closed, latched, and locked, and its opening would prevent safe takeoff and return to landing.***

Where an unlatched door could open and prevent a safe takeoff and return to landing, a more conspicuous aural warning is needed in addition to the visual indication. It is intended that this system should function in a manner similar to the takeoff configuration warning systems required by § 25.703 ("Takeoff warning system"). The visual display for these doors may be either a red light or a display on the master warning system. Examples of doors requiring these aural warnings are:

- doors for which the structural integrity of the fuselage would be compromised if the door is not fully closed, latched, and locked; or
- doors that, if open, would prevent rotation or interfere with controllability to an unacceptable level.

f. Visual inspection provision.

(1) ***Each door for which unlatching could be a hazard, must have a provision for direct visual inspection to determine, without ambiguity, if the door is fully closed, latched, and locked. The provision must be permanent and discernible under operational lighting conditions, or by means of a flashlight or equivalent light source.***

A provision is necessary for direct visual inspection of the closed position of the door and the status of each of the latches and locks, because dispatch of an airplane may be permitted in some circumstances when a flight deck or other remote indication of an unsafe door remains after all door closing, latching, and locking operations have been completed. Because the visual indication is used in these circumstances to determine whether to permit flight with a remote indication of an unsafe door, the visual indication should have a higher level of integrity than, and be independent of, the remote indication.

(a) The provisions should:

1 allow direct viewing of the position of the locks to show, without ambiguity, whether or not each latch is latched and each lock is in the locked position. For doors that do not have a lock for each latch, direct viewing of the position of the latches and restraining mechanism may be necessary for determining that all the latches are latched. Indirect viewing, such as by optical devices or indicator flags, may be acceptable, provided that there is no failure mode that could allow a false latched or locked indication.

2 preclude false indication of the status of the latches and locks as a result of changes in the viewing angle. The status should be obvious without the need for any deductive processes by the person making the assessment.

3 be of a robust design so that, following correct rigging, no unscheduled adjustment is required. Furthermore, the design should be resistant to unauthorized adjustment.

4 preclude mis-assembly that could result in a false latched and locked indication.

(b) If markings are used to assist the identification of the status of the latches and locks, such markings must include permanent physical features to ensure that the markings will remain accurately positioned.

(c) Although the visual means should be unambiguous in itself, placards and instructions may be necessary to interpret the status of the latches and locks.

(d) If optical devices or windows are used to view the latches and locks, it should be demonstrated that they provide a clear view and are not subject to fogging, being obstructed from dislodged material, or giving a false indication of the position of each latch and lock. Such optical devices and window materials should be resistant to scratching, crazing, and any other damage from all materials and fluids commonly used in the operation and cleaning of airplanes.

g. Certain maintenance doors, removable emergency exits, and access panels.

(1) Some doors not normally opened except for maintenance purposes or emergency evacuation and some access panels need not comply with certain paragraphs of this section as follows:

(a) Access panels that are not subject to cabin pressurization and would not be a hazard if unlatched during flight need not comply with paragraphs 25.783(a) through 25.783(f), but must have a means to prevent inadvertent opening during flight.

(b) Inward-opening removable emergency exits that are not normally removed, except for maintenance purposes or emergency evacuation, and

flight deck-openable windows need not comply with paragraphs 25.783(c) and 25.783(f).

(c) Maintenance doors that meet the conditions of § 25.783(h), and for which a placard is provided limiting use to maintenance access, need not comply with paragraphs 25.783(c) and 25.783(f).

h. ***Doors that are not a hazard.***

Section 25.783 recognizes four categories of doors:

- Doors for which the initial opening is not inward, and are presumed to be hazardous if they become unlatched.
- Doors for which the initial opening is inward, and could be a hazard if they become unlatched.
- Doors for which the initial opening is inward, and would not be a hazard if they become unlatched.
- Small access panels outside pressurized compartments for which opening is of little or no consequence to safety.

Section 25.783(h) describes those attributes that are essential before a door in the normal (unfailed) condition can be considered not to be a hazard during flight.

7. **STRUCTURAL REQUIREMENTS.** The door structure, including its mechanical features (such as hinges, stops, and latches) that can be subjected to airframe loading conditions, must be designed either to the damage-tolerance requirements of § 25.571 (amendment 25-45 or later), or to the earlier fail-safe requirements, depending on the certification basis of the airplane. In assessing the extent of damage under § 25.571 and § 25.783, consideration must be given to single element failures in the primary door structure such as:

- frames,
- stringers,
- intercostals,
- latches,
- hinges,
- stops, and
- stop supports.

The skin panels on doors that must comply with § 25.571, amendment 25-45 or later, should be designed to be damage-tolerant, with a high probability of detecting any crack before the crack causes door failure or cabin depressurization. The obvious partial failure criteria or the damage-tolerance criteria may be used for the design of skin panels on doors with an earlier certification basis.

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