Federal Aviation Administration
Aviation Rulemaking Advisory Committee

Transport Airplane and Engine Issue Area
Powerplant Installation Harmonization Working Group

Task 1 – Installation

Task Assignment

Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Subcommittee; Installation Harmonization Working Group

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of establishment of installation harmonization working group.

SUMMARY: Notice is given of the establishment of the Installation Harmonization Working Group of the Transport Airplane and Engine Subcommittee. This notice informs the public of the activities of the Transport Airplane and Engine Subcommittee of the Aviation Rulemaking Advisory Committee.

FOR FURTHER INFORMATION CONTACT: Mr. William J. (Joe) Sullivan, Executive Director, Transport Airplane and Engine Subcommittee, Aircraft Certification Service (AIR-3), 800 Independence Avenue SW., Washington, DC 20591, Telephone: (202) 267-9554; FAX: (202) 267-5364.

SUPPLEMENTARY INFORMATION: The Federal Aviation Administration (FAA) established an Aviation Rulemaking Advisory Committee (56 FR 2190, January 22, 1991) which held its first meeting on May 23, 1991 (56 FR 20492, May 3, 1991). The Transport Airplane and Engine Subcommittee was established at that meeting to provide advice and recommendations to the Director, Aircraft Certification Service, FAA regarding the airworthiness standards for transport airplanes, engines and propellers in parts 25, 33, and 35 of the Federal Aviation Regulations (14 CFR parts 25, 23 and 35).

The FAA announced at the Joint Aviation Authorities (JAA)-Federal Aviation Administration (FAA) Harmonization Conference in Toronto, Ontario, Canada, (June 2-5, 1992) that it would consolidate within the Aviation Rulemaking Advisory Committee structure an ongoing objective to "harmonize" the Joint Aviation Requirements (JAR) and the Federal Aviation Regulations (FAR). Coincident with that announcement, the FAA assigned to the Transport Airplane and Engine Subcommittee those projects related to JAR/FAR 25, 33 and 35 harmonization which were then in the process of being coordinated between the JAA and the FAA. The harmonization process included the intention to present the results of JAA/FAA coordination to the public in the form of either a Notice of Proposed Rulemaking or an advisory circular—an objective comparable to and compatible with the assigned to the Aviation Rulemaking Advisory Committee. The Transport Airplane and Engine Subcommittee, consequently, established the Installation Harmonization Working Group.

Specifically, the Working Group's tasks are the following:

The Installation Harmonization Working Group is charged with making recommendations to the Transport Airplane and Engine Subcommittee concerning the FAA disposition of the following subjects recently coordinated between the JAA and FAA:

Task 1—Installations (Engines): Develop recommendations concerning new or revised requirements for the installation of engines on transport category airplanes and determine the relationship, if any, of the requirements of FAR 25.1309 to these engine installations (FAR 25.901).

Task 2—Windmilling Without Oil: Determine the need for requirements for turbine engine windmilling without oil (FAR 25.903).

Task 3—Non-contained Failures: Revise advisory material on non-contained engine failure requirements (FAR 25.903 and related provisions of FAR Parts 23, 27, 29, 33, and 35, as appropriate; AC 20-128). The working group should draw members for this task from the interests represented by the General Aviation and Business Airplane, and Rotorcraft Subcommittees.

Task 4—Thrust Reversing Systems: Develop recommendations concerning new or revised requirements and guidance material for turbojet engine thrust reversing systems (FAR 25.933).

Reports:

A. Recommend time line(s) for completion of each task, including rationale, for Subcommittee consideration at the meeting of the subcommittee held following publication of this notice.

B. Give a detailed conceptual presentation on each task to the Subcommittee before proceeding with the work stated under items C and D, below. If tasks 1, 2, and 4 require the development of more than one Notice of Proposed Rulemaking, identify what proposed amendments will be included in each notice.

C. Draft a Notice of Proposed Rulemaking for tasks 1, 2 and 4 proposing new or revised requirements, a supporting economic analysis, and other required analysis, with any other collateral documents (such as Advisory Circulars) the Working Group determines to be needed.

D. Draft a change to Advisory Circular 120-128 for task 3 providing appropriate advisory material for each task. When the detailed briefing under item B, above, and this report are presented to the subcommittee, the Subcommittee and Working Group Chairs should arrange for a joint meeting with the General Aviation and Business Airplane and Rotorcraft Subcommittees to consider and join in the consensus on the results of those reports.

E. Give a status report on each task at each meeting of the Subcommittee.

The Installation Harmonization Working Group will be comprised of experts from those organizations having an interest in the tasks assigned. A Working Group member need not necessarily be a representative of one of the organizations of the parent Transport Airplane and Engine Subcommittee or of the full Aviation Rulemaking Advisory Committee. An individual who has expertise in the subject matter and wishes to become a member of the Working Group should write the person listed under the caption **FOR FURTHER INFORMATION CONTACT** expressing that desire, describing his or her interest in the task, and the expertise he or she would bring to the Working Group. The request will be reviewed with the Subcommittee and Working Group Chairs and the individual will be advised whether or not the request can be accommodated.

The Secretary of Transportation has determined that the information and use of the Aviation Rulemaking Advisory Committee and its subcommittees are necessary in the public interest in connection with the performance of duties of the FAA by law. Meetings of the full Committee and any subcommittees will be open to the public except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the Installation Harmonization Working Group will not be open to the public except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of Working Group meetings will be made.

Issued in Washington, DC, on December 4, 1992.

William J. Sullivan,

Executive Director, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

[FR Doc. 92-30118 Filed 12-10-92; 8:45 am]

BILLING CODE 4910-13-M

Recommendation Letter

PPI Task 1

June 17, 1999

Ref: 990617/2

2 3014

To: Aviation Rulemaking Advisory Committee,
Transport Airplane and Engines Issues Group (TAEIG)

From: Aviation Rulemaking Advisory Committee,
Powerplant Installations Harmonization Working Group (PPIHWG)

Subject: Harmonization of FAR/JAR 25.901(c)

The PPIHWG has reviewed the subject rule as requested by Task 1, Harmonize FAR/JAR 25.901. Technical agreement has been achieved on 25.901(c) by revising both the FAR and JAR versions of the rule and developing new advisory material. To facilitate the rulemaking process, the FAA and PPIHWG have agreed that this rule change proposal will be integrated into the §25.1309 related NPRM previously recommended by ARAC. Consequently, the PPIHWG is not including any draft NPRM with this submittal.

The attached rule change proposal and associated new Advisory Circular are submitted to TAEIG for approval and submittal to the FAA for further processing.

The JAA will prepare an equivalent NPA to introduce the revised requirement and the new advisory material.

Respectfully,

George P. Sallee (Co-Chair PPIHWG)

Jean-Claude Tchavdarov (Co-Chair PPIHWG)

Amend section 25.901 paragraph (c) to read as follows:

§ 25.901 Powerplant Installations

* * * * *

(c) The powerplant installation must comply with FAR 25.1309, except that the effects of the following need not comply with FAR 25.1309(b):

(i) Engine case burn through or rupture;
(ii) Uncontained engine rotor failure; and
(iii) Propeller debris release.

U.S. Department
of Transportation

**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

SEP 18 1995

Mr. Gerald R. Mack
Aviation Rulemaking Advisory Committee
Boeing Commercial Airplane Group
P.O. Box 3707, M/S 67-UM
Seattle, WA 98124-2207

Dear Mr. Mack:

Thank you for your August 8 letter forwarding the Aviation Rulemaking Advisory Committee's (ARAC) recommendations in the form of two advisory circulars: Design Considerations for Minimizing Hazards Caused by Uncontained Turbine Engine and Auxiliary Power Unit Rotor Failure; and Advisory Material for Compliance with Rotor Burst Rule.

I want to thank the aviation community for its commitment to ARAC and its expenditure of resources to develop the recommendations. We in the Federal Aviation Administration pledge to process the documents expeditiously as high-priority actions.

Again, let me thank ARAC, and particularly the Powerplant Installation Harmonization Working Group, for its dedicated efforts in completing this task.

Sincerely,

Anthony J. Broderick
Associate Administrator for
Regulation and Certification

Recommendation

Ref: 990617/2

Attachment 2

#1 23015

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: SAFETY ASSESSMENT OF POWERPLANT INSTALLATIONS

Date: [6/15/99]

AC/ACJ No: 25.901X

Initiated By: ANM-110

Change: Draft 13-MKM

THIS DOCUMENT IS A WORKING DRAFT AND IS NOT FOR PUBLIC RELEASE

1. PURPOSE.. This Advisory Circular (AC) describes an acceptable means for showing compliance with the requirements of § 25.901(c), "Powerplant, General -- Installation," of 14 CFR part 25 of the Federal Aviation Regulations (FAR). This document describes a method of conducting a "System Safety Assessment" of the powerplant installation as a means for demonstrating compliance. This guidance is intended to supplement the engineering and operational judgment that must form the basis of any compliance findings. The guidance provided in this document is meant for 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 powerplant installation 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. RELATED FAR SECTIONS. Sections 25.571, 25.901, 25.903, 25.933, 25.1309, and 25.1529; Sections 33.28 and 33.75

3. APPLICABILITY. The guidance provided in this document applies to powerplant installations on transport category airplanes that are subject to the requirements of § 25.901. This guidance specifically concerns demonstrating compliance with the requirements of § 25.901(c), which states:

> *(c) The powerplant installation must comply with § 25.1309, except that the effects of the following need not comply with § 25.1309(b):*
>
> *(1) Engine case burn through or rupture;*

(2) Uncontained engine rotor failure; and

(3) Propeller debris release."

Section 25.901(c) is intended to provide an overall safety assessment of the powerplant installation that is consistent with the requirements of § 25.1309, while accommodating unique powerplant installation compliance policies. It is intended to augment rather than replace other applicable part 25 design and performance standards for transport category airplanes.

In accommodating unique policies related to powerplant compliance, the FAA has determined that specific guidance relative to demonstrating compliance with § 25.1309(b) is needed; such guidance is contained in this AC. [No unique compliance requirements for § 25.1309(a) and (c) are required for powerplant installations.]

Wherever this AC indicates that compliance with other applicable regulations has been accepted as also meeting the intent of § 25.901(c) for a specific failure condition, no additional dedicated safety analysis is required. Where this AC may conflict with AC 25.1309-1B ("System Design Analysis"), this AC shall take precedence for providing guidance in demonstrating compliance with § 25.901(c).

When assessing the potential hazards to the aircraft caused by the powerplant installation, the effects of an engine case rupture, uncontained engine rotor failure, engine case burn-through, and propeller debris release are excluded from § 25.901(c)/§ 25.1309. The effects and rates of these failures are minimized by compliance with part 33 ("Airworthiness Standards: Aircraft Engines"); part 35 ("Airworthiness Standards: Propellers"); § 25.903(d)(1) ("Engines"); § 25.905(d) ("Propellers"); and § 25.1193 ("Cowling and nacelle skin").

Furthermore, the effects of encountering environmental threats or other operating conditions more severe than those for which the aircraft is certified (such as volcanic ash or operation above placard speeds) need not be considered in the § 25.901(c)/§ 25.1309 compliance process. However, if a failure or malfunction can affect the subsequent environmental qualification or other operational capability of the installation, this effect should be accounted for in the § 25.901(c)/§ 25.1309 assessment.

The terms used in this AC are intended to be identical to those used in AC 25.1309-1B.

4. BACKGROUND. The fail-safe concept was inherent in § 25.1309(b) as codified. When first promulgated, that regulation originally stated:

"The equipment, systems, and installations must be designed to prevent hazards to the airplane if they malfunction or fail."

Compliance with that rule normally was demonstrated for only one failure or malfunction at a time. However, as stated in the preamble to Notice of Proposed Rulemaking (NPRM), docket number 68-18 (August 22, 1968), which proposed new § 25.1309(b), (c), and (d) requirements, the trend towards more critical, complex, and integrated aircraft systems made it clear that the co-existence of *multiple* failures must be addressed. The question of how many co-existent failures must be tolerated without posing a hazard to the airplane was answered in that proposal by establishing a "logical and acceptable inverse relationship between the *probability* and the *severity* of each failure condition." This concept was adopted in § 25.1309 and applied specifically to powerplant installations through the creation of § 25.901(c) in Amendment 25-23 (35 FR 5671, Apr. 8, 1970).

As the first version of AC 25.1309 was being drafted, some powerplant specialists, both within the FAA and the industry, apparently became concerned that this new policy focused too much on the "frequency of occurrence" aspect of the new fail-safe rule and not enough on the "prevention of hazards" inherent in traditional fail-safe practices. While *average risk* was seen as an appropriate guide to help an engineer determine the level of redundancy required in the design, it was considered inappropriate to use *frequency of occurrence* to justify exposure to a preventable hazard. Furthermore, there was no restriction on the use of *probability*. This was of particular concern if this new policy could be used to accept the kinds of potentially catastrophic single failures that had historically been prohibited as far back as the early 1950's in Civil Air Regulation (CAR) 4b.606(b).

These concerns led to the revision of FAR 25.901(c) in Amendment 25-40 (42 FR 15042, March 17, 1977), to read:

> *"(c) For each powerplant . . . installation, it must be established that no single failure or malfunction or probable combination of failures will jeopardize the safe operation of the airplane, except that the failure of structural elements need not be considered if the probability of such failure is extremely remote."*

By changing § 25.901(c) as indicated above, FAA intended to safeguard the traditional "no single failure" concept while allowing for some "frequency of occurrence" considerations for multiple failures. However, unlike § 25.1309(b)(2) of the time, § 25.901(c) did not provide for regulation of hazards that did not jeopardize the safe operation of the airplane.

Despite the fact that the FAA stated in the preamble to NPRM, docket number 75-19, that § 25.1309 still applied to powerplant installations by its own terms, there was much controversy following the issuance of Amendment 25-40 as to whether or not the more generally applicable § 25.1309 still applied to powerplant installations. At the very least, the Amendment 25-40 revision to § 25.901(c) created standards and undefined terminology that were inconsistent with those of the more generally applicable § 25.1309; this fact has caused significant difficulty both for applicants and for the FAA as well.

The shortcomings of both § 25.901(c) and § 25.1309, the desire to have more consistent standards and terminology throughout FAR part 25, and the initiative to harmonize FAR and JAR policies, has lead to the creation of the current § 25.901(c) (__FR______________) and the current § 25.1309 (__FR______________) with advisory material.

The current § 25.901(c) references the § 25.1309 rule. Section 25.1309 preserves the "*no single failure will jeopardize*" concept of § 25.901(c), while clarifying the "*inverse relationship between probability and severity*" concept.

This AC 25.901X has been developed to:

- ensure that the intent of the current § 25.901(c) rule is applied when finding compliance,
- advise on § 25.1309 concepts as they relate to the powerplant (and APU) installations, and
- assure that any uncertainty in that compliance finding is identified and suitably managed.

[This safety analysis also may be used to verify that the intent of the engine isolation requirements of § 25.903(b) are met.]

5. <u>GENERAL SYSTEM SAFETY ASSESSMENT GUIDANCE.</u> Compliance with § 25.901(c)/§ 25.1309 may be shown by a System Safety Assessment (SSA) substantiated by appropriate testing and/or comparable service experience. Such an assessment may range from a simple report that offers descriptive details associated with a failure condition, interprets test results, compares two similar systems, or offers other qualitative information; to a detailed failure analysis that may include estimated numerical probabilities.

The depth and scope of an acceptable SSA depends on:

- the complexity and criticality of the functions performed by the system(s) under consideration,
- the severity of related failure conditions,
- the uniqueness of the design and extent of relevant service experience,
- the number and complexity of the identified causal failure scenarios, and
- the detectability of contributing failures.

The SSA criteria, process, analysis methods, validation and documentation should be consistent with the guidance material contained in AC 25.1309-1B. Wherever there is unique guidance specifically for powerplant installations, this is delineated in Section 6, below.

In carrying out the SSA for the powerplant installation for § 25.901(c)/§ 25.1309, the results of the engine (and propeller) failure analyses (reference § 33.28 and § 33.75) should be used as inputs for those powerplant failure effects that can have an impact on the aircraft. However, the SSA undertaken in response to part 33 and part 35 may not address all the potential effects that an engine and propeller as installed may have on the aircraft.

For those failure conditions covered by analysis under part 33 and/or part 35, and for which the installation has no effect on the conclusions derived from these analyses, no additional analyses will be required to demonstrate compliance to § 25.901(c)/§ 25.1309.

The effects of structural failures on the powerplant installation, and vice versa, should be carefully considered when conducting system safety assessments:

a. Effects of structural failures on powerplant installation. The powerplant installation must be shown to comply with § 25.901(c) following structural failures that are anticipated to occur within the fleet life of the airplane type. Since the probability of a given structural failure is normally considered remote, consideration of structural failures is normally limited to potentially hazardous and catastrophic failure conditions. This should be part of the assessment of powerplant installation failure condition causes.

Examples of structural failures that have been of concern in previous powerplant installations are:

(1) Thrust reverser restraining load path failure that may cause a catastrophic inadvertent deployment.

(2) Throttle quadrant framing or mounting failure that causes loss of control of multiple engines.

(3) Structural failures in an avionics rack or related mounting that cause loss of multiple, otherwise independent, powerplant functions/components/systems.

b. Effects of powerplant installation failures on structural elements. Any effect of powerplant installation failures that could influence the suitability of affected structures, should be identified during the § 25.901(c) assessment and accounted for when demonstrating compliance with the requirements of part 25, Subpart C ("Structure") and D ("Design and Construction"). This should be part of the assessment of powerplant installation failure condition effects.

Some examples of historical interdependencies between powerplant installations and structures include:

(1) Fuel system failures that cause excessive fuel load imbalance.

(2) Fuel vent, refueling, or feed system failures that cause abnormal internal fuel tank pressures.

(3) Engine failures that cause excessive loads/vibration.

(4) Powerplant installation failures that expose structures to extreme temperatures or corrosive material.

6. <u>SPECIFIC § 25.901(c) SYSTEM SAFETY ASSESSMENT GUIDANCE.</u> This section provides compliance guidance unique to powerplant installations.

a. <u>Undetected Thrust Loss</u>. The SSA discussed in Section 5 should consider undetected thrust loss and its effect on aircraft safety. The assessment should include an evaluation of the failure of components and systems that could cause an undetected thrust loss, except those already accounted for by the approved average-to-minimum engine assessment.

(1) In determining the criticality of undetected thrust losses from a system design and installation perspective, the following should be considered:

(a) Magnitude of the thrust loss,*

(b) Direction of thrust,

(c) Phase of flight, and

(d) Impact of the thrust loss on aircraft safety.

(*Although it is common for safety analyses to consider the total loss of one engine's thrust, a small undetected thrust loss that persists from the point of takeoff power set could have a more significant impact on the accelerate/stop distances and takeoff flight path/obstacle clearance capability than a detectable single engine total loss of thrust failure condition at V_1)

(2) In addition, the level at which any thrust loss becomes detectable should be validated. This validation is typically influenced by:

(a) Impact on aircraft performance and handling,

(b) Resultant changes in powerplant indications,

(c) Instrument accuracy and visibility,

(d) Environmental and operating conditions,

(e) Relevant crew procedures and capabilities, etc.

(3) Less than 3% thrust loss on any one engine, and up to 3% on all engines, generally has been accepted as not having any significant adverse effect on safety. A 10% thrust asymmetry or a symmetric 20% thrust loss may be considered detectable.

b. Detected Thrust Loss. While detectable engine thrust losses can range in magnitude from 3% to 100% of total aircraft thrust, the total loss of useful thrust (inflight shutdown/IFSD) of one or more engines usually has the largest impact on aircraft capabilities and engine-dependent systems. Furthermore, single and multiple engine IFSD's tend to be the dominant thrust loss-related failure conditions for most powerplant installations. In light of this, the guidance in this AC focuses on the IFSD failure conditions. The applicant must consider other engine thrust loss failure conditions, as well, if they are anticipated to occur more often than the IFSD failure condition, or if they are more severe than the related IFSD failure condition.

(1) **Single Engine IFSD.** The effects of any single engine thrust loss failure condition, including IFSD, on aircraft performance, controllability, maneuverability, and crew workload are accepted as meeting the intent of § 25.901(c) if compliance is also demonstrated with:

- § 25.111 ("Takeoff path"),
- § 25.121 ("Climb: one-engine-inoperative"), and
- § 25.143 ("Controllability and Maneuverability -- General").

(a) Nevertheless, the effects of an IFSD on other aircraft systems or in combination with other conditions also must be assessed as part of showing compliance with § 25.901(c)/§ 25.1309. In this case, it should be noted that a single engine IFSD can result from any number of single failures, and that the rate of IFSD's range from approximately $1x10^{-4}$ to $1x10^{-5}$ per engine flight hour. This rate includes all failures within a typical powerplant installation that affect one -- and only one -- engine. Those failures within a typical powerplant that can affect more than one engine are described in Section 6.b.(2), below.

(b) If an estimate of the IFSD rate is required for a specific turbine engine installation, any one of the following methods are suitable for the purposes of complying with § 25.901(c)/§ 25.1309(b):

(i) Estimate the IFSD rate based on service experience of similar powerplant installations;

(ii) Perform a bottom-up reliability analysis using service, test, and any other relevant experience with similar components and/or technologies to predict component failure modes and rates; or

(iii) Use a conservative value of 1×10^{-4} per flight hour.

(c) If an estimate of the percentage of these IFSD's for which the engine is restartable is required, the estimate should be based on relevant service experience.

(d) The use of the default value delineated in paragraph 6.b.(1)(b)(iii) is limited to traditional turbine engine installations. However, the other methods [listed in 6.b.(1)(b)(i) and (ii), above] are acceptable for estimating the IFSD rates and restartability for other types of engines, such as reciprocating engines or some totally new type of engine or unusual powerplant installation with features such as a novel fuel feed system. In the case of new or novel components, significant non-service experience may be required to validate the reliability predictions. This is typically attained through test and/or technology transfer analysis.

(e) Related issues that should be noted here are:

(i) Section 25.901(b)(2) sets an additional standard for installed engine reliability. That regulation is intended to ensure that all technologically feasible and economically practical means are used to assure the continued safe operation of the powerplant installation between inspections and overhauls.

(ii) The effectiveness of compliance with § 25.111, § 25.121 and § 25.143 in meeting the intent of § 25.901(c) for single engine thrust loss is dependent on the accuracy of the human factors assessment of the crew's ability to take appropriate corrective action. For the purposes of compliance with § 25.901(c) in this area, it may be assumed that the crew will take the corrective actions called for in the airplane flight manual procedures and associated approved training.

(2) Multiple Engine IFSD. The guidance in AC 25.1309-1B provides for a catastrophic failure condition to exceed 1×10^{-9} per hour under certain conditions (i.e., well-proven design and construction techniques, and a predicted overall airplane level rate of catastrophic failures within historically-accepted service experience). Typical engine IFSD rates have been part of this historically-accepted service experience, and these IFSD rates are continuously improving. However, typical engine IFSD rates may not meet the AC 25.1309 condition that calls for 1×10^{-9} per hour for a catastrophic multiple engine IFSD.

(a) Current typical turbine engine IFSD rates, and the resulting possibility of multiple independent IFSD's leading to a critical power loss, are considered acceptable for compliance with § 25.901(c) without quantitative assessment. Therefore, there is no need to calculate the overall airplane level risk of catastrophic failure, even though the probability of a catastrophic failure condition due to multiple engine IFSD's may exceed 1×10^{-9}.

(b) Nevertheless, some combinations of failures within aircraft systems common to multiple engines may cause a catastrophic multiple engine thrust loss. These should be assessed to ensure that they meet the *extremely improbable* criteria. Systems to be considered include:

- fuel system,
- air data system,
- electrical power system,
- throttle assembly,
- engine indication systems, etc.

(c) The means of compliance described above is only valid for turbine engines, and for engines that can demonstrate equivalent reliability to turbine engines, using the means outlined in Section 6.a. of this AC. The approach to demonstrating equivalent reliability should be discussed early in the program with the certifying authority on a case-by-case basis.

c. Automatic Takeoff Thrust Control System. Part 25, Appendix I ["Installation of an Automatic Takeoff Thrust Control System (ATTCS)"], specifies the minimum reliability levels for these automatic systems. In addition to showing compliance with these reliability levels for certain combinations of failures, other failure conditions that can arise as a result of introducing such a system must be shown to comply with FAR § 25.901(c)/§ 25.1309.

d. Thrust Management Systems. A System Safety Assessment is essential for any airplane system that aids the crew in managing engine thrust (i.e., computing target engine ratings, commanding engine thrust levels, etc.). As a minimum, the criticality and failure hazard classification must be assessed. The system criticality will depend on:

- the range of thrust management errors it could cause,
- the likelihood that the crew will detect these errors and take appropriate corrective action, and

- the severity of the effects of these errors with and without crew intervention.

The hazard classification will depend on the most severe effects anticipated from any system. The need for more in-depth analysis will depend upon the systems complexity, novelty, initial failure hazard classification, relationship to other aircraft systems, etc.

(1) Automated thrust management features, such as autothrottles and target rating displays, traditionally have been certified on the basis that they are only conveniences to reduce crew workload and do not relieve the crew of any responsibility for assuring proper thrust management. In some cases, malfunctions of these systems can be considered to be minor, at most. However, for this to be valid, even when the crew is no longer directly involved in performing a given thrust management function, the crew must be provided with information concerning unsafe system operating conditions to enable them to take appropriate corrective action.

(2) Consequently, when demonstrating compliance with § 25.901(c)/§ 25.1309, failures within any automated thrust management feature which, if not detected and properly accommodated by crew action, could create a catastrophe should be either:

(a) considered a catastrophic failure condition when demonstrating compliance with § 25.1309(b)/§ 25.901(c); or

(b) considered an unsafe system operating condition when demonstrating compliance with the warning requirements of § 25.1309(c).

e. Thrust Reverser. Compliance with § 25.933(a) ("Reversing systems") provides demonstration of compliance with § 25.901(c)/§ 25.1309 for the thrust reverser inflight deployment failure conditions. A standard § 25.901(c)/§ 25.1309 System Safety Assessment should be performed for any other thrust reverser-related failure conditions.

7. TYPICAL FAILURE CONDITIONS FOR POWERPLANT SYSTEM INSTALLATIONS. The purpose of this section is to provide a list of typical failure conditions that ***may*** be applicable to a powerplant system installation. This list is by no means all-encompassing, but it captures some failure conditions that have been of concern in previous powerplant system installations. The applicant should review the specific failure conditions identified during the preliminary SSA for its installation against this list to assist in ensuring that all failure conditions have been identified and properly addressed.

As stated previously in this AC, the assessment of these failure conditions may range from a simple report that offers descriptive details associated with a failure condition, interprets test results, compares two similar systems, or offers other qualitative information; to a detailed failure analysis that may include estimated numerical probabilities. The assessment criteria, process, analysis methods, validation, and documentation should be consistent with the guidance material contained in AC 25.1309-1B.

a. Fire Protection System -- Failure Conditions:

(1) Loss of detection in the presence of a fire.

(2) Loss of extinguishing in the presence of a fire.

(3) Loss of fire zone integrity in the presence of a fire.

(4) Loss of flammable fluid shut-off or drainage capability in the presence of a fire.

(5) Creation of an ignition source outside a fire zone but in the presence of flammable fluids.

b. Fuel System -- Failure Conditions:

(1) Loss of fuel feed/fuel supply.

(2) Inability to control lateral and longitudinal balance.

(3) Hazardously misleading fuel indications.

(4) Loss of fuel tank integrity.

(5) Loss of fuel jettison.

(6) Uncommanded fuel jettison.

c. Powerplant Ice Protection -- Failure Conditions:

(1) Loss of propeller, inlet, engine, or other powerplant ice protection on multiple powerplants when required.

(2) Loss of engine/powerplant ice detection.

(3) Activation of engine inlet ice protection above limit temperatures.

d. Propeller Control -- Failure Conditions:

(1) Inadvertent fine pitch (overspeed, excessive drag).

(2) Inadvertent coarse pitch (over-torque, thrust asymmetry)

(3) Uncommanded propeller feathering.

(4) Failure to feather.

(5) Inadvertent application of propeller brake in flight.

(6) Unwanted reverse thrust (pitch).

e. Engine Control and Indication -- Failure Conditions:

(1) Loss of thrust.

(2) Loss of thrust control, including asymmetric thrust, thrust increases, thrust decreases, thrust fail fixed, and unpredictable engine operation.

(3) Hazardously misleading display of powerplant parameter(s).

f. Thrust Reverser -- Failure Conditions:

(1) Inadvertent deployment of one or more reversers.

(2) Failure of one or more reversers to deploy when commanded.

(3) Failure of reverser component restraints (i.e., opening of D-ducts in flight, release of cascades during reverser operation , etc.).

WORKING DRAFT -- NOT FOR PUBLIC RELEASE.

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

#1
23016

Subject: MINIMIZING THE HAZARDS FROM ENGINE CASE BURNTHROUGH	**Date:** DRAFT -- 6/12/2000 **Initiated By:** ANM-110	**AC No: 20.135-2X** **Change:**

1. **PURPOSE.**

a. This Advisory Circular (AC) describes an acceptable means for demonstrating compliance with certain powerplant fire protection requirements of Title 14, Code of Federal Regulations (CFR) part 25 and part 23. Part 25 contains the airworthiness standards applicable to normal, utility, acrobatic, and commuter category airplanes; 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 design precautions to minimize the hazards to an airplane in the event a fire originating within the engine case that burns through the engine case.

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

c. As of the issuance date, the guidance provided in this AC was harmonized with that of the European Joint Aviation Authorities (JAA). It provides a method of compliance that has been found acceptable to both the FAA and JAA.

d. 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. While these guidelines are not mandatory, they are derived from extensive Federal Aviation Administration and industry experience in determining compliance with the pertinent regulations.

e. This advisory circular does not change, create any additional, authorize changes in, or permit deviations from, regulatory requirements.

2. CANCELLATION. Paragraph 8. of FAA Advisory Circular 20-135, "Powerplant Installation and Propulsion System Component Fire Protection Test Methods, Standards and Criteria," is canceled. Additionally, the AC number of that document has been changed to AC 20-135-1.

3. APPLICABILITY. This AC applies to general aviation and transport category airplanes type certificated under 14 CFR parts 23 and 25, respectively (and airplanes type certificated under predecessor parts 3 and 4b of the Civil Air Regulations), for which a new, amended, or supplemental type certificate is requested.

4. RELATED DOCUMENTS.

a. Title 14, Code of Federal Regulations (Federal Aviation Regulations).

§ 23.903	Engines
§ 25.903	Engines (as amended by amendments 25-45 and 25-73)

b. FAA Advisory Circulars (AC). The AC listed below can be obtained from the U.S. Department of Transportation, Subsequent Distribution Center, SVC-121.23, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, Maryland 20785.

AC 20-135-1	Powerplant Installation and Propulsion System Component Fire Protection Test Methods, Standards, and Criteria, 2/15/90 [or the equivalent International Standard Order (ISO) 2685]

5. DEFINITIONS. For the purposes of this AC, the following definitions should be used.

a. Continued Safe Flight and Landing. The condition where an airplane is capable of continued controlled flight and landing at an airport, possibly using emergency procedures, but without requiring exceptional pilot skill or strength.

b. Critical Component. Any system or structural component whose failure would contribute to or cause a hazardous or catastrophic failure condition.

c. Engine Case Burnthrough. A hole in the engine case that allows a high pressure and high temperature gas stream to escape from the engine.

6. BACKGROUND.

a. Although the design of turbine engines has continually improved over the years, service experience has shown that turbine engine case burnthrough events ("burnthroughs") continue to occur. Burnthroughs have been caused by failure conditions or maintenance errors that have resulted in such problems as:

- leakage in the fuel nozzle supply line,
- malfunctions of the fuel nozzle,
- burnout of the turbine vane, and
- cracking of the combustion chamber.

b. Engine case burnthrough can result in high intensity flames emanating from the engine, with flame temperatures in excess of the capabilities of even fireproof materials to withstand them. Burnthroughs can be difficult to detect by normal zonal fire detection systems. The FAA's Aviation Rulemaking Advisory Committee (ARAC) collected historical service data for the period 1980 to 1998, which indicated that, out of 122 burnthrough events, 42 percent were detected by the fire detection system, and the remainder were detected by other means. The eight most severe events resulted in serious damage to the engine and engine-mounted components, major damage to the nacelle, and damage to the engine strut /pylon. ***[JD QUESTION: Do we know if these incidents were on transport airplanes or on small ones? Do we need to differentiate?]***

7. <u>ENGINE CASE BURNTHROUGH MODEL.</u>

a. Applicants should carry out an assessment to determine the likely areas where a burnthrough could occur and the location of critical components that could be affected by the same burnthrough event. Consideration should be given both to available service experience of the engine (or similar types of engines), and to the analysis of failure modes within the whole engine that could result in burnthrough.

b. Additionally, applicants should establish foreseeable flame characteristics, including, as appropriate:

- temperature,
- pressure,
- hole location,
- hole diameter,
- heat flux, and
- temperature variation with time, distance, and flame trajectory.

c. In case no detailed information is available, applicants may consider the following flame characteristics as a model:

3000^0 F with a nominal 1-inch (25 mm) diameter orifice, having a torch pressure the same as the maximum combustion chamber pressure of the installed engine.*

** The nominal diameter may vary in consideration of the engine size.*

d. Applicants should assess the flame burnthrough length by using the most severe torching flame that could burn through the engine case. This is important because, depending on the engine design, there may be areas other than those adjacent to the immediate combustion section that are at risk for damage.

e. If no detailed information is available from the engine manufacturer about areas of the installation that are specifically at risk, applicants should consider the engine case burnthrough "threat area" to exist as follows:

- from 15 degrees upstream of where the fuel enters the engine core case, and
- downstream to 15 degrees aft of the trailing edge of the last high power (HP) turbine blades.

8. METHOD OF COMPLIANCE

a. Carry out a design assessment, using the appropriate flame burnthrough characteristics established in paragraph 7., above, to predict all the foreseeable effects of burnthrough on the airplane and its occupants. Special attention should be paid to direct or indirect effects on critical components and combustible materials. Consider that the temperatures and pressures associated with engine case burnthrough are typically higher than the criteria and melting point of the materials used in firewall construction. Therefore, conventional firewalls can fail under these conditions, which could cause damage to critical systems located in the engine, pylon, fuselage, or wing.

b. Evaluate the engine installation and airplane features to determine if engine case burnthrough can result in a hazard. Consider the following:

(1) For those airplanes where a hazard *would* result, ensure that the design features demonstrate that practical design precautions have been taken to minimize the risk to the airplane.

(2) Conduct an analysis of the installation for the hazards generated by engine case burnthrough. The analysis should define the aircraft hazards generated by the engine manufacturer's burnthrough threat model or the model described in paragraph 7., above.

(3) In the analysis, consider that the burnthrough conditions will exist until the engine is shut down. Unless the burnthrough barrier can be shown to last for the duration of the longest planned flight, provide a means for detection of the burnthrough conditions which

annunciates to the crew (since it is crew action to complete an engine shutdown that provides the protection to the airplane).

(4) Given that the detection system's warning to the crew may be inhibited, any burnthrough shield/barrier should be designed to last for a sufficient time to:

- protect the airplane, and
- allow the detection systems to function, and
- assure that crew recognition and engine shutdown is initiated.

(5) The shield must not permit hazardous burnthrough/penetration of the barrier in less time than what would be needed for a burnthrough inhibit indication to initiate, plus 30 seconds for crew action to shut down the engine.

9. GENERAL DESIGN PRACTICES. Fire detector system sensors typically are installed between the outside of the combustor/hp turbine cases and critical components. In this position, the sensors will detect a torching flame before any critical components can be damaged to level that would create a hazard to the airplane. However, service history indicates that, if the sensors are located in the threat area, they can be severely damaged by engine case burnthrough. Detection systems with sensors located in the threat area, including the associated annunciation logic, should be designed to detect a torching flame even if the sensors are severed or otherwise damaged by the burnthrough. Some considerations that have proven to be effective for minimizing these hazards include:

a. For detection:

(1) Installation of traditional overheat fire detection/indication.

(2) Use of engine indications [e.g., high exhaust gas temperature (EGT)] for limiting exposure to the event.

(3) Use of alternative detection technologies that may provide improved reliability of detection and indication of a burnthrough.

b. For shielding of critical locations:

(1) Installation of metal (e.g., tantalum) or metal combinations (e.g., ceramic-coated metallic shielding) ablative materials to protect critical components.

(2) Use of intervening installation components (sacrificial) to serve as time-limited barriers, and to allow for the detection of back side over-temperature and subsequent engine shutdown.

(3) Use of fan air scrubbing at minimum airspeed.

c. Location of critical components: If a burnthrough could result in hazardous damage to a fuel tank installation of a dry bay may be an acceptable method of mitigating this threat. *[JD COMMENT: I think something was left out of this sentence that was added. Pls re-read it and let me know.]*

10. COMPLIANCE DEMONSTRATION FOR TORCHING FLAME BARRIERS. Applicants may demonstrate compliance with the torching flame barrier requirements by using an appropriate model as described in paragraph 7., above. Prior to beginning the compliance process, applicants should submit their proposed certification method to the FAA office that is responsible for the project for coordination and approval.

Aircraft Certification Service

Federal Register

Monday,
May 3, 2004

Part III

Department of Transportation

Federal Aviation Administration

14 CFR Part 25

Design Standards for Fuselage Doors on Transport Category Airplanes; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA–2003–14193; Amdt. No. 25–114]

RIN 2120–AH34

Design Standards for Fuselage Doors on Transport Category Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: The Federal Aviation Administration (FAA) amends the design standards for fuselage doors, hatches, and exits on transport category airplanes. This action improves door integrity by providing design criteria that ensure doors remain secure under all circumstances that service experience has shown can happen. Adopting this amendment also relieves a certification burden on industry by removing regulatory differences between the airworthiness standards and related guidance material of the United States and Europe.

DATES: This amendment becomes effective June 2, 2004.

FOR FURTHER INFORMATION CONTACT: Jeff Gardlin, Federal Aviation Administration, Airframe and Cabin Safety Branch, ANM–115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98055–4056; telephone (425) 227–2136; fax 425–227–1320; e-mail *jeff.gardlin@faa.gov.*

SUPPLEMENTARY INFORMATION:

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by:

(1) Searching the Department of Transportation's electronic Docket Management System (DMS) Web page (*http://dms.dot.gov/search*);

(2) Visiting the Office of Rulemaking's Web page at *http://www.faa.gov/avr/arm/index.cfm*; or

(3) Accessing the Government Printing Office's Web page at *http://www.access.gpo.gov/su_docs/aces/aces140.html.*

You can also get a copy from the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267–9680. Be sure to identify the amendment number or docket number of this rulemaking.

You can search the electronic form of all comments in any of our dockets by the individual filing the comment (or signing the comment, if filed for an association, business, labor union, for example). You may review DOT's complete Privacy Act statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70; Pages 19477–78) or you may visit *http://dms.dot.gov.*

Small Business Regulatory Enforcement Fairness Act

The Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 requires FAA to comply with small entity requests for information or advice about compliance with statutes and regulations within its jurisdiction. If you are a small entity and you have a question about this document, you may contact your local FAA official, or the person listed under **FOR FURTHER INFORMATION CONTACT**. You can find out more about SBREFA on the Internet at *http://www.faa.gov/avr/arm/sbrefa.htm*, or by e-mailing us at *9-AWA-SBREFA@faa.gov.*

Background

This final rule responds to notice of proposed rulemaking (NPRM) No. 03–01, published in the **Federal Register** on January 14, 2003 (68 FR 1932).

In NPRM No. 03–01, the FAA proposed to revise and reorganize the existing rules in Title 14, Code of Federal Regulations (CFR), part 25, to provide:

- Clarification of the existing design requirements for doors.
- Definitive criteria for door design requirements covered in the existing rules by general text.
- Additional fail-safe requirements and detailed door design requirements, based on the recommendations of the National Transportation Safety Board (NTSB) and the Air Transport Association (ATA), and on current industry practice.

In the NPRM you will find a history of the problems and discussions of the safety considerations supporting our course of action. You will also find a discussion of the current requirements and why they do not adequately address the problem. We also refer to the recommendations of the Aviation Rulemaking Advisory Committee (ARAC) that we relied on in developing the proposed rule. The NPRM also discusses alternatives we considered and the reasons for rejecting the ones we did not adopt.

The background material in the NPRM also contains the basis and rationale for these requirements and, except where we have specifically expanded on the background elsewhere in this preamble, supports this final rule as if contained here. That is, any future discussions on the intent of the requirements may refer to the background in the NPRM as though it was in the final rule itself. It is therefore not necessary to repeat the background in this document.

Definitions

The following definitions will aid the reader in understanding the final rule:

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

NTSB Safety Recommendations

After its investigation of airplane accidents associated with fuselage doors opening during flight, the NTSB issued several safety recommendations concerning doors on transport category airplanes. In the NPRM, we discuss those recommendations and the FAA's response.

After the conclusion of the harmonization activity that led to this final rule, the FAA received another safety recommendation, A–02–020, from the NTSB. The NTSB recommended the FAA, "Require all newly certificated transport category airplanes [to] have a system for each emergency exit door to relieve pressure so that they can only be opened on the ground after a safe differential pressure level is attained." In the NPRM, we specifically sought comments on this recommendation. Although no one commented on this issue, we believe there should be some means to address the potential for unsafe opening of a door on the ground. The specific action proposed in the safety recommendation is not necessarily the only approach to this concern. We have not yet determined whether a regulatory action is appropriate, or what form that regulatory action might take. Because the issue is important, we will add discussion to Advisory Circular (AC) 25.783–1, ''Fuselage Doors, Hatches, and Exits,'' addressing the need to consider safety of occupants opening exits when there is differential pressure remaining on the airplane. This will identify the issue and permit manufacturers to address it in the most effective manner for their specific design.

History

In the United States, 14 CFR part 25 contains the airworthiness standards for type certification of transport category airplanes. Manufacturers of transport category airplanes must show that each airplane they produce of a different type design complies with the appropriate part 25 standards.

In Europe, Joint Aviation Requirements (JAR)-25 contains the airworthiness standards for type certification of transport category airplanes. The Joint Aviation Authorities (JAA) of Europe developed these standards, which are based on part 25, to provide a common set of airworthiness standards within the European aviation community. Thirty-seven European countries accept airplanes type certificated to the JAR–25 standards, including airplanes manufactured in the U.S. type certificated to JAR–25 standards for export to Europe.

Although part 25 and JAR–25 are similar, they are not identical in every respect. When airplanes are type certificated to both sets of standards, the differences between part 25 and JAR–25 can result in substantial added costs to manufacturers and operators. These additional costs, however, often do not bring about an increase in safety.

Recognizing that a common set of standards would not only benefit the aviation industry economically, but also preserve the necessary high level of safety, the FAA and the JAA began an effort in 1988 to ''harmonize'' their respective aviation standards.

After beginning the first steps towards harmonization, the FAA and JAA soon realized that traditional methods of rulemaking and accommodating different administrative procedures was neither sufficient nor adequate to make noticeable progress towards fulfilling the harmonization goal. The FAA identified the ARAC as an ideal vehicle for helping to resolve harmonization issues, and in 1992 the FAA tasked ARAC to undertake the entire harmonization effort.

Despite the work that ARAC has undertaken to address harmonization, there remain many regulatory differences between part 25 and JAR–25. The current harmonization process is costly and time-consuming for industry, the FAA, and the JAA. Industry has expressed a strong need to finish the harmonization program as quickly as possible to relieve the drain on their resources and finally to establish one acceptable set of standards.

Representatives of the FAA and JAA proposed an accelerated process to reach harmonization, the ''Fast Track Harmonization Program.'' The FAA introduced the Fast Track Harmonization Program on November 26, 1999 (64 FR 66522). This rulemaking is a ''fast-track'' project.

You can find further details on ARAC, its role in harmonization rulemaking activity, and the Fast Track Harmonization Program in the tasking statement (64 FR 66522, November 26, 1999) and the first NPRM published under this program, Fire Protection Requirements for Powerplant Installations on Transport Category Airplanes (65 FR 36978, June 12, 2000).

Related Activity

The new European Aviation Safety Authority (EASA) was established and formally came into being on September 28, 2003. The JAA worked with the European Commission (EC) to develop a plan to ensure a smooth transition from the JAA to the EASA. As part of the transition, the EASA will absorb all functions and activities of the JAA, including its efforts to harmonize the JAA regulations with those of the U.S. These JAR standards have already been incorporated into the EASA ''Certification Specifications for Large Aeroplanes'' (CS–25) in similar, if not identical, language. The EASA CS–25 became effective October 17, 2003.

Related Advisory Circular

The FAA plans to revise AC 25.783–1 to provide guidance for showing compliance with structural and functional safety standards for doors and their operating systems. When we issue the AC, we will publish a notice in the **Federal Register**.

Discussion of Comments

Eight commenters responded to the NPRM. The commenters include three private citizens, two foreign airworthiness authorities, an industry association representing the interests of several groups in the aviation industry, an association representing the interests of pilots in the U.S and Canada, and an airplane manufacturer. All commenters generally support the proposed rule. Comments, including suggested changes, are discussed below.

Comment: An individual with cabin door design experience suggests that limiting the requirement to address intentional opening to airplanes with more than 19 passenger seats would improve safety. The commenter bases his position on the premise that airplanes with 19 or fewer passenger seats are a small percentage of the commercial fleet, the operator typically knows the passengers, and it is unlikely a person would intentionally open the exit. The commenter states that such a requirement could become a hazard to emergency evacuation of these airplanes because the rules only require a single pair of exits. If the means to prevent intentional opening were to fail and the exit could not be opened, a higher percentage of exits would become unavailable than for larger airplanes.

FAA reply: While the commenter's points have some merit, the requirement is not related to how the airplane is operated. The intent of the requirement is to safeguard against an event of intentional opening, regardless of whether the operator knows the passengers. The commenter's statement therefore is not relevant that the number of passengers carried in commercial service on airplanes with 19 or fewer passenger seats is a small percentage of the total. Consideration of exit availability is more significant.

In a review of airplanes of this size as part of the FAA's response to NTSB safety recommendation A–02–020, it does appear that many current designs could be affected by this requirement. On some airplanes, the main entry door is openable at relatively high differential pressures. Whether this would constitute a hazard to the airplane would have to be investigated. The entry door is typically the largest exit on the airplane. Although the loss of this exit would represent more than 50 percent of the evacuation capability of the airplane, the remaining exit would still be adequate for the number of people on board. The intentional opening of the exit is an immediate hazard to the airplane. This concern outweighs the potential decrease in evacuation capability that could occur if the exit were unavailable because of a system failure, and if there were an emergency evacuation at the same time. While the evacuation capability would be significantly reduced, it would still satisfy the regulatory requirements and be acceptable for the number of people on board.

No changes were made to the final rule.

Comment: One commenter recommends adding the following requirements:

- Ability to close the doors after being opened in an emergency.
- Reliability tests.
- Function with minor fuselage deformation.
- Display of slide arming status on the fuselage exterior

FAA reply: The commenter's recommendations relate to emergency evacuation, which was not the focus of the NPRM. Although the NPRM had some ancillary impact on evacuation requirements, it focused on the airworthiness of fuselage doors. The commenter's proposed requirements for reliability tests and door opening with minor deformation are effectively already part of the regulations. Section 25.809(g) requires provisions to minimize the probability of jamming of the emergency exits resulting from fuselage deformation that might occur in a minor crash landing. In addition, regulations governing escape slide performance result in extensive tests of exit system reliability. These recommendations are beyond the scope of the NPRM as they relate primarily to emergency evacuation.

No changes were made to the final rule.

Comment: The Civil Aviation Authority of the United Kingdom (CAA–UK) recommends adoption of the proposed requirements and a clarifying change to the intent of § 25.783(a)(2). The CAA–UK states that since the hazardous condition identified in § 25.783(a)(2) is unlatching, then the event to be prevented should also be unlatching.

FAA reply: The rule, as proposed, would require that inadvertent opening of the door be extremely improbable, but does not specifically address the unlatching event. Section 25.783 has historically categorized the opening of a door as the safety threat and has not addressed intermediate steps in the sequence of that opening. This rule is more specific regarding the reason that a door can become a hazard. The purpose of paragraph (a)(2) is to prevent the hazardous condition. It therefore makes sense that the requirement address unlatching as extremely improbable, rather than simply door opening. In this case, the FAA assumes that if the door unlatches, it will open.

The Joint Aviation Authorities (JAA) submitted the final version of their Notice of Proposed Amendment, NPA, 25D–301, to the docket for NPRM No. 03–01 and recommends the FAA adopt the language of the NPA, which they revised to address comments, including those of the CAA–UK. As our NPRM was the result of harmonization efforts with the JAA and Transport Canada, we consider the content of the JAA NPA important in maintaining harmonization.

As the result of the CAA–UK comment and in order to maintain harmonization, § 25.783(a)(2) is changed.

Comment: The JAA proposes adding the following new requirement to the final rule to address an issue not specifically covered in NPRM No. 03–01: ''Each door that could result in a hazard if not closed, must have means to prevent the latches from being moved to the latched position unless the door is closed.''

FAA reply: The proposed requirements contain provisions to prevent the out-of-sequence actuation of certain elements of the door mechanism. This approach is a basic philosophy to ensure that false or misleading indications are not created by out-of-sequence operation. For example, proposed § 25.783(d)(5) states: ''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.'' In this case, the JAA has adopted a new requirement to address latch movement prior to closing. Many current designs already incorporate such means.

While not directly covered in the NPRM, this requirement is clearly in keeping with the overall approach to fuselage door safety expressed in the NPRM and could be seen as a logical outgrowth of the proposed requirements. We have determined, however, that there may be instances where such a provision would not be necessary, and so adopting the requirement for all designs would impose an unnecessary burden. For example, a manually-operated passenger entry door could have latches that, when in the latched position, would inhibit movement of the door to the closed position. That is, the door is obviously standing open and would be obvious to the person operating the door. In that case, the design of the door fulfills the objective of preventing door closure with the latches in the latched position.

Conversely, for some designs, such a provision would clearly be necessary to meet the requirements of this rule as written. An example would be a cargo door that is operated remotely and could be positioned such that the operator would not be able to visually determine whether it was properly closed. If the latches were in the latched position, this would add to the potential confusion. Paragraph (e)(2), as adopted, requires positive means, clearly visible from the operator's station, to indicate that each door that could be a hazard is not properly closed, latched, and locked. For the remotely operated cargo door, satisfying the requirement would likely require a means to prevent the door from being closed with the latches in the latched position. While this rule will not maintain strict harmonization with the JAA, we believe the intent of the requirement as adopted by the JAA is still satisfied. Designs found acceptable by the FAA can also be found acceptable by the JAA.

No changes were made as the result of this comment.

The CAA–UK and one individual also had several editorial suggestions for clarity on the use of terms, which we accepted where appropriate. These suggestions are purely editorial and do not change the substance of the requirements.

Paperwork Reduction Act

There are no current or new requirements for information collection associated with this final rule.

International Compatibility

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 has determined that there are no ICAO Standards and Recommended Practices that correspond to this final rule.

Executive Order 12866 and DOT Regulatory Polices and Procedures

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 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 Trade Agreements Act (19 U.S.C. 2531–2533) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, this Trade Act also requires the consideration of international standards and, where appropriate, that they be the basis of U.S. standards. And fourth, the Unfunded Mandates Reform

Act of 1995 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).

The FAA has determined that this final rule has minimal costs, and that it is neither ''a significant regulatory action'' as defined in Executive Order 12866, nor ''significant'' as defined in DOT's Regulatory Policies and Procedures. Further, this rule will not have a significant economic impact on a substantial number of small entities, will reduce barriers to international trade, and will not impose an Unfunded Mandate on State, local, or tribal governments, or on the private sector.

The DOT Order 2100.5 prescribes policies and procedures for simplification, analysis, and review of regulations. If it is determined that the expected impact is so minimal that the rule does not warrant a full evaluation, a statement to that effect and the basis for it is included in the regulation. Accordingly, the FAA has determined the expected impact of this rule is so minimal the rule does not warrant a full evaluation. We provide the basis for this determination as follows.

Currently, airplane manufacturers must satisfy both part 25 and the European standards to certificate transport category aircraft in both the United States and Europe. Meeting two sets of certification requirements raises the cost of developing a new transport category airplane often with no increase in safety. In the interest of fostering international trade, lowering the cost of aircraft development, and making the certification process more efficient, the FAA, European Authorities, Transport Canada, and aircraft manufacturers have been working to create, to the maximum possible extent, a single set of certification requirements accepted in the United States, Europe, and Canada. As explained in detail previously, these efforts are referred to as ''harmonization.''

This final rule amends the current fuselage door standard contained in 14 CFR part 25 with a new improved door standard. This new standard will set forth, as a regulatory requirement, some of the existing technical guidance criteria that have been determined to be necessary for safety but which, up to this point, have not been included in the regulations. In addition, this rule addresses recommendations from the NTSB and the ATA task force on doors.

With the one exception noted, this rule harmonizes the FAA and European requirements for fuselage doors. The rule will relieve a certification burden on industry by eliminating regulatory differences between the airworthiness standards and related guidance material of the United States and Europe.

Costs and Benefits of the Final Rule

In the NPRM, the FAA identified only one section, 25.783(b), where manufacturers would incur a measurable cost. For the other changes, the FAA has not made quantitative cost estimates but has provided qualitative cost estimates. There were no comments to the docket contesting these estimates.

1. *Paragraph 25.783(a)* is descriptive and has no expected cost.

2. *Paragraph 25.783(b)* relates to opening by persons. The requirement is new to have design precautions taken to minimize the possibility for a person to open a door intentionally during flight, but is expected to be accommodated in existing design practices for all but one United States manufacturer. (Requirements regarding inadvertent opening are not new.) One manufacturer expects to incur an estimated cost of $0.75 million, which will include the requirements for the prevention of intentional opening of the doors.

3. *Paragraph 25.783(c)* covers means to prevent pressurization. The requirement to consider single failures in the pressurization-inhibit system is new, but is believed to be industry practice. Thus, the cost, if any, is expected to be very little for a new design. The provision to permit certain doors to forego this system is actually cost relieving and could result in a minor cost reduction in some cases.

4. *Paragraph 25.783(d)* covers latching and locking. Most of these changes incorporate recommendations currently contained in an advisory circular. The vast majority of airplanes already comply, and basic design practice is to comply with these requirements. Therefore, these requirements, while new, have minimal cost impact. The requirement for each latch to have a lock that monitors the latch position formalizes existing practice. The requirement to eliminate forces in the latching mechanism that could load the locks is new and may not be complied with in all cases currently. The FAA believes that these costs are minimal.

5. *Paragraph 25.783(e)* covers warning, caution, and advisory indications. The reliability of the door indication system will be required to be higher for all doors. This is expected to have only a small cost impact, as will the requirement for an aural warning for certain doors, and the requirement to provide an indication to the door operator.

6. *Paragraph 25.783(f)* contains the visual inspection provision requirement. The requirement for direct visual inspection is extended to more door types, and may add costs in some cases.

7. *Paragraph 25.783(g)* deals with certain maintenance doors, removable emergency exits, and access panels. This provision may reduce costs in some cases as indicated in the AC.

8. *Paragraph 25.783(h)* covers doors that are not a hazard and is intended to provide relief for certain doors, so it could reduce costs.

9. Paragraphs 25.783(i), 25.783(j), 25.809(b), 25.809(c), and 25.809(f) move text to other sections, improve clarity, and have no impact on cost. These changes, as summarized in the NPRM, are repeated here for the reader's understanding of the changes.

- The changes to § 25.783(i) are removed from existing § 25.783 and added in § 25.810 (''Emergency egress assist means and escape routes'') as a new paragraph (e).
- The changes to § 25.783(j) move the special requirement for lavatory doors from the current paragraph (j) to the new § 25.820 (''Lavatory doors'').
- Section 25.809(b) (''Emergency exit arrangement'') is revised by adding a new paragraph (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.
- The changes to § 25.809(c) include the requirement that the means of opening emergency exits also must be marked so 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.
- Section 25.809(f) is revised 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.

10. *Paragraph 25.807* corrects an unintended deletion.

Summary of Costs and Benefits

This final rule is expected to—

• Maintain or provide an increase in the level of safety;

• Have only a relatively small effect on costs when compared to current industry practice; and

• Provide some cost savings to manufacturers by avoiding duplicative testing and reporting that could result from the existence of differing requirements under the current standards.

This rule will codify existing guidance, standard industry practice, and industry recommendations for the design standards for fuselage doors. The FAA believes the cost savings from a single certification requirement exceed the minimal additional compliance cost. The FAA therefore considers the final rule will be cost-beneficial. This conclusion is reinforced by industry's support for the proposal and the absence of comments to the docket regarding the economic analyses.

Final Regulatory Flexibility Determination

The Regulatory Flexibility Act (RFA) of 1980, 50 U.S.C. 601–612, as amended, 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 RFA 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 businesses and governments.

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

If, however, an agency determines that the rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the RFA 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.

As stated in the initial regulatory flexibility determination, the FAA certifies that this final rule will not have a significant economic impact on a substantial number of small entities for two reasons:

First, the rule is expected to provide relief from some regulatory costs. The final rule will require that manufacturers of transport category aircraft meet a single certification requirement, rather than different standards for the United States and Europe. Manufacturers of the affected airplanes are believed to already meet, or expect to meet most standards that will be required by this final rule.

Second, all affected U.S. transport-aircraft category manufacturers exceed the Small Business Administration small-entity criterion of 1,500 employees for aircraft manufacturers, as published by the Small Business Administration in 13 CFR part 121, Small Business Size Regulations; Size Standards (65 FR 53533, September 5, 2000). The current U.S. part 25 airplane manufacturers include: Boeing, Cessna Aircraft, Gulfstream Aerospace, Learjet (owned by Bombardier), Lockheed Martin, McDonnell Douglas (a wholly-owned subsidiary of The Boeing Company), Raytheon Aircraft, and Sabreliner Corporation. All of these manufacturers have more than 1,500 employees and therefore do not qualify as small entities.

The FAA certified in the NPRM that the proposal would not have a significant impact on a substantial number of small entities. There were no comments to the docket contesting this FAA certification. Consequently, as the rule is expected to provide cost relief, there are no small entities affected, and the comments received did not dispute the initial economic analysis, the FAA certifies that this final rule will not have a significant economic impact on a substantial number of small entities.

Trade Impact Assessment

The Trade Agreement Act of 1979 prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

The FAA has assessed the potential effect of this final rule and has determined that it will reduce trade barriers by narrowing the differences between U.S. standards and European international standards.

Unfunded Mandates Assessment

The Unfunded Mandates Reform Act of 1995 (the Act) is intended, among other things, to curb the practice of imposing unfunded Federal mandates on State, local, and tribal governments. Title II of the Act requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in the expenditure of $100 million or more (adjusted annually for inflation) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector. Such a mandate is deemed to be a ''significant regulatory action.''

This final rule does not contain such a mandate. The requirements of Title II of the Act therefore do not apply.

Executive Order 13132, Federalism

The FAA has analyzed this final rule under the principles and criteria of Executive Order 13132, Federalism. We determined that this action will not have a substantial direct effect on the States, or the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government, and therefore does not have federalism implications.

Plain English

Executive Order 12866 (58 FR 51735, October 4, 1993) requires each agency to write regulations that are simple and easy to understand. We invite your comments on how to make these regulations easier to understand, including answers to questions such as the following:

• Are the requirements clearly stated?

• Do the regulations contain unnecessary technical language or jargon that interferes with their clarity?

• Would the regulations be easier to understand if they were divided into more (but shorter) sections?

• Is the description in the preamble helpful in understanding the final rule?

Please send your comments to the address specified in the **FOR FURTHER INFORMATION CONTACT** section.

Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the FAA, when modifying its regulations 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. In the NPRM, we requested comments on whether the proposed rule should apply differently to intrastate operations in Alaska. We did not receive any comments, and we have determined, based on the administrative record of this rulemaking, that there is no need to make any regulatory distinctions applicable to intrastate aviation in Alaska.

Environmental Analysis

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

Regulations that Significantly Affect Energy Supply, Distribution, or Use.

The FAA has analyzed this final rule under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). We have determined that it is not a ''significant energy action'' under the executive order because it is not a ''significant regulatory action'' under Executive Order 12866, and it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Recording and recordkeeping requirements.

The Amendment

■ In consideration of the foregoing, the Federal Aviation Administration amends 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. Section 25.783 is revised 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 any 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 any 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 25.812 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—

(1) No single failure will prevent more than one exit from being opened; and

(2) 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 paragraph (h) of this section 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 any 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 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) 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.

(6) 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.

(7) Each door for which unlatching would not result in a hazard is not required to have a locking mechanism meeting the requirements of paragraphs (d)(3) through (d)(6) of this section.

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

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

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

(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 of the door 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 open 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 paragraph (h) of this section, 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 subpart C of this part.

(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 25.812, and must be readily accessible:

(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 flightcrew 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) to read 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 Renton, Washington, on April 20, 2004.

Ali Bahrami,

Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.

[FR Doc. 04–9948 Filed 4–30–04; 8:45 am]

BILLING CODE 4910–13–P