Federal Aviation Administration
Aviation Rulemaking Advisory Committee

Transport Airplane and Engine Issue Area
Flight Test Harmonization Working Group

Task 5 – Harmonize 14 CFR Parts 25.111, 25.161, 25.175, 25.1527, 25.1583(f), 25.1585, 25.1587, 25X1516

Task Assignment

exemption is necessary or appropriate in the public interest and consistent with the protection of investors and the purposes fairly intended by the policies and provisions of the Act. OLDE Management states that the requested relief satisfies this standard.

4. OLDE Management asserts that the Transaction arose out of business considerations unrelated to the Trust and OLDE Management. OLDE Management states that there is insufficient time to obtain shareholder approval of the New Agreements prior to the Closing Date.

5. OLDE Management represents that under the New Agreements, during the Interim Period, the scope and quality of services provided to the Funds will be at least equivalent to the scope and quality of the services it previously provided under the Existing Agreements. OLDE Management states that if any material change in its personnel occurs during the Interim Period, OLDE Management will apprise and consult with the Board to ensure that the Board, including a majority of the Independent Trustees, are satisfied that the scope and quality of the advisory services provided to the Funds will not be diminished. OLDE Management also states that the compensation payable to it under the New Agreements will be no greater than the compensation that would have been paid to OLDE Management under the Existing Agreements.

Applicant's Conditions

OLDE Management agrees as conditions to the issuance of the exemptive order requested by the application that:

1. The New Agreements will have the same terms and conditions as the Existing Agreements except for the dates of execution and termination.

2. Fees earned by OLDE Management in respect of the New Agreements during the Interim Period will be maintained in an interest-bearing escrow account, and amounts in the account (including interest earned on such fees) will be paid to (i) OLDE Management in accordance with the New Agreements, after the requisite shareholder approvals are obtained, or (ii) the respective Fund, in absence of such shareholder approval.

3. The Trust will convene a meeting of shareholders of each Fund to vote on approval of the respective New Agreements during the Interim Period (but in no event later than April 15, 2000).

4. OLDE Management or an affiliate, not the Funds, will bear the costs of preparing and filing the application and the costs relating to the solicitation of shareholder approval of the Funds necessitated by the Transaction.

5. OLDE Management will take all appropriate steps so that the scope and quality of advisory and other services provided to the Funds during the Interim Period will be at least equivalent, in the judgment of the Trust's Board, including a majority of the Independent Trustees, to the scope and quality of services previously provided under the Existing Agreements. If personnel providing material services during the Interim Period change materially, OLDE Management will apprise and consult with the Board to assure that the trustees, including a majority of the Independent Trustees, of the Trust are satisfied that the services provided will not be diminished in scope or quality.

For the SEC, by the Division of Investment Management, under delegated authority.

Margaret H. McFarland,

Deputy Secretary.

[FR Doc. 99–30709 Filed 11–24–99; 8:45 am]

BILLING CODE 8010–01–M

SECURITIES AND EXCHANGE COMMISSION

SUNSHINE ACT MEETING

AGENCY MEETING: Notice is hereby given, pursuant to the provisions of the Government in the Sunshine Act, Pub. L. 94–409, that the Securities and Exchange Commission will hold the following meeting during the week of November 29, 1999.

A closed meeting will be held on Wednesday, December 1, 1999, at 11:00 a.m.

Commissioners, Counsel to the Commissioners, the Secretary to the Commission, and recording secretaries will attend the closed meeting. Certain staff members who have an interest in the matters may also be present.

The General Counsel of the Commission, or his designee, has certified that, in his opinion, one or more of the exemptions set forth in 5 U.S.C. 552b(c) (4), (8), (9)(A) and (10) and 17 CFR 200.402(a) (4), (8), (9)(A) and (10), permit consideration for the scheduled matters at the closed meeting.

Commissioner Unger, as duty officer, voted to consider the items listed for the closed meeting in a closed session.

The subject matter of the closed meeting scheduled for Wednesday, December 1, 1999, will be:

Institution and settlement of injunctive actions

Institution and settlement of administrative proceedings of an enforcement nature

At times, changes in Commission priorities require alterations in the scheduling of meeting items. For further information and to ascertain what, if any, matters have been added, deleted or postponed, please contact:

The Office of the Secretary at (202) 942–7070.

Dated: November 23, 1999.

Jonathan G. Katz,

Secretary.

[FR Doc. 99–30918 Filed 11–23–99; 2:54 pm]

BILLING CODE 8010–01–M

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues—New and Revised Tasks

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of new and revised task assignments for the Aviation Rulemaking Advisory Committee (ARAC).

SUMMARY: Notice is given of new tasks assigned to and accepted by the Aviation Rulemaking Advisory Committee (ARAC) and of revisions to a number of existing tasks. This notice informs the public of the activities of ARAC.

FOR FURTHER INFORMATION CONTACT: Dorenda Baker, Transport Airplane Directorate, Aircraft Certification Service (ANM–110), 1601 Lind Avenue, SW., Renton, WA 98055; phone (425) 227–2109; fax (425) 227–1320.

SUPPLEMENTARY INFORMATION:

Background

The FAA has established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FAA Administrator, through the Associate Administrator for Regulation and Certification, on the full range of the FAA's rulemaking activities with respect to aviation-related issues. This includes obtaining advice and recommendations on the FAA's commitment to harmonize its Federal Aviation Regulations (FAR) and practices with its trading partners in Europe and Canada.

One area ARAC deals with is transport airplane and engine issues. These issues involve the airworthiness standards for transport category

airplanes and engines in 14 CFR parts 25, 33, and 35 and parallel provisions in 14 CFR parts 121 and 135. The corresponding Canadian standards are contained in Parts V, VI, and VII of the Canadian Aviation Regulations. The corresponding European standards are contained in Joint Aviation Requirements (JAR) 25, JAR–E, JAR–P, JAR–OPS–Part 1, and JAR–26.

As proposed by the U.S. and European aviation industry, and as agreed between the Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (JAA), an accelerated process to reach harmonization has been adopted. This process is based on two procedures:

(1) Accepting the more stringent of the regulations in Title 14 of the Code of Federal Regulations (FAR), Part 25, and the Joint Airworthiness Requirements (JAR); and

(2) Assigning approximately 41 already-tasked significant regulatory differences (SRD), and certain additional part 25 regulatory differences, to one of three categories:

- Category 1—Envelope
- Category 2—Completed or near complete
- Category 3—Harmonize

The Revised Tasks

ARAC will review the rules identified in the "FAR/JAR 25 Differences List," dated June 30, 1999, and identify changes to the regulations necessary to harmonize part 25 and JAR 25. ARAC will submit a technical report on each rule. Each report will include the cost information that has been requested by the FAA. The tasks currently underway in ARAC to harmonize the listed rules are superseded by this tasking.

New Tasks

The FAA has submitted a number of new tasks for the Aviation Rulemaking Advisory Committee (ARAC), Transport Airplane and Engine Issues. As agreed by ARAC, these tasks will be accomplished by existing harmonization working groups. The tasks are regulatory differences identified in the above-referenced differences list as Rule type = P–SRD.

New Working Group

In addition to the above new tasks, a newly established Cabin Safety Harmonization Working Group will review several FAR/JAR paragraphs as follows:

ARAC will review the following rules and identify changes to the regulations necessary to harmonize part 25 and JAR:

(1) Section 25.787;
(2) Section 25.791(a) to (d);
(3) Section 25.810;
(4) Section 25.811;
(5) Section 25.819; and
(6) Section 25.813(c).

ARAC will submit a technical report on each rule. Each report will include the cost information that has been requested by the FAA.

The Cabin Safety Harmonization Working Group would be expected to complete its work for the first five items (identified as Category 1 or 2) before completing item 6 (identified as Category 3).

Schedule

Within 120 days of tasking/retasking:

- For Category 1 tasks, ARAC submits the Working Groups' technical reports to the FAA to initiate drafting of proposed rulemaking documents.
- For Category 2 tasks, ARAC submits technical reports, including already developed draft rules and/or advisory materials, to the FAA to complete legal review, economic analysis, coordination, and issuance.

June 2000: For Category 3 tasks, ARAC submits technical reports including draft rules and/or advisory materials to the FAA to complete legal review, economic analysis, coordination, and issuance.

ARAC Acceptance of Tasks

ARAC has accepted the new tasks and has chosen to assign all but one of them to existing harmonization working groups. A new Cabin Safety Harmonization Working Group will be formed to complete the remaining tasks. The working groups serve as staff to ARAC to assist ARAC in the analysis of the assigned tasks. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts a working group's recommendations, it forwards them to the FAA and ARAC recommendations.

Working Group Activity

All working groups are expected to comply with the procedures adopted by ARAC. As part of the procedures, the working groups are expected to accomplish the following:

1. Document their decisions and discuss areas of disagreement, including options, in a report. A report can be used both for the enveloping and for the harmonization processes.

2. If requested by the FAA, provide support for disposition of the comments received in response to the NPRM or review the FAA's prepared disposition of comments. If support is requested, the Working Group will review comments/disposition and prepare a report documenting their recommendations, agreement, or disagreement. This report will be submitted by ARAC back to the FAA.

3. Provide a status report at each meeting of ARAC held to consider Transport Airplane and Engine Issues.

Partcipation in the Working Groups

Membership on existing working groups will remain the same, with the formation of subtask groups, if appropriate. The Cabin Safety Harmonization Working Group will be composed of technical experts having an interest in the assigned task. A working group member need not be a representative of a member of the full committee.

An individual who has expertise in the subject matter and wishes to become a member of the Cabin Safety Harmonization Working Group should write to the person listed under the caption **FOR FURTHER INFORMATION CONTACT** expressing that desire, describing his or her interest in the tasks, and stating the expertise he or she would bring to the working group. All requests to participate must be received no later than December 30, 1999. The requests will be reviewed by the assistant chair, the assistant executive director, and the working group chair, and the individuals will be advised whether or not the request can be accommodated.

Individuals chosen for membership on the Cabin Safety Harmonization Working Group will be expected to represent their aviation community segment and participate actively in the working group (e.g., attend all meetings, provide written comments when requested to do so, etc.). They also will be expected to devote the resources necessary to ensure the ability of the working group to meet any assigned deadline(s). Members are expected to keep their management chain advised of working group activities and decisions to ensure that the agreed technical solutions do not conflict with their sponsoring organization's position when the subject being negotiated is presented to ARAC for a vote.

Once the working group has begun deliberations, members will not be added or substituted without the approval of the assistant chair, the assistant executive director, and the working group chair.

The Secretary of Transportation has determined that the formation and use of ARAC are necessary and in the public interest in connection with the performance of duties imposed on the FAA by law.

Meetings of ARAC will be open to the public. Meetings of the working groups 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 November 19, 1999.

Anthony F. Fazio,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 99–30774 Filed 11–24–99; 8:45 am]

BILLING CODE 4910–13–M

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

RIN 2120–AA64

General Aviation Summit; Notice of Public Meeting

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of public meeting.

SUMMARY: This notice announces a public meeting on the subject of the continued airworthiness of the U.S. general aviation fleet of aircraft. The purpose of the meeting is to gather information and discuss technical issues related to problems associated with the increasing average age of the general aviation fleet. Particular emphasis will be given to continued field support, service difficulty experiences and reporting, and inspection issues.

DATES: The public meeting will be held January 11–12, 2000, starting at 8:00 a.m. each day, in Kansas City, Missouri. Registration will begin at 8:00 a.m. on the first day of the meeting.

ADDRESSES: The public meeting will be held at the following location: The Adam's Mark Hotel, Grand Ballroom, 9103 East 39th Street, Kansas City, Missouri 64133.

Persons who are unable to attend the meeting may mail their comments to: Federal Aviation Administration, (FAA), Central Region, Small Airplane Directorate, Attention: Mr. Bill Timberlake, 901 Locust, Room 301, Kansas City, Missouri 64106. Written comments regarding the subject of this meeting will receive the same consideration as statements made at the public meeting.

FOR FURTHER INFORMATION CONTACT: Requests to present a statement at the public meeting and questions regarding the logistics of the meeting should be directed to FAA, Central Region, Small Airplane Directorate, Attention: Mr. Bill Timberlake, 901 Locust, Room 301, Kansas City, Missouri 64106; telephone: (816) 329–4178; facsimile (816) 329–4091.

SUPPLEMENTARY INFORMATION:

Participation at the Public Meeting

Requests from persons who wish to present oral statements at the public meeting should be received by the FAA no later than 10 days prior to the meeting. Such requests should be submitted to Mr. Bill Timberlake as listed in the section titled **FOR FURTHER INFORMATION CONTACT** above, and should include a written summary of oral remarks to be presented, and an estimate of time needed for the presentation. Requests received after the date specified above will be scheduled if there is time available during the meeting; however, the names of those individuals may not appear on the written agenda. The FAA will prepare an agenda of speakers that will be available at the meeting. To accommodate as many speakers as possible, the amount of time allocated to each speaker may be less than the amount of time requested. Those persons desiring to have available audiovisual equipment should notify the FAA when requesting to be placed on the agenda.

Background

The average airplane in the general aviation fleet of the United States is approximately 34 years old. In the next 10 years, this average age is expected to rise to over 41 years old. By the year 2019, the average general aviation airplane will be almost 50 years old.

Certain type design airplanes may be subject to pending rulemaking, which would require the development of Structural Inspection Documents (SIDs), and a mandated structural inspection program. These actions, if adopted, would not commence for at least 5 years and may not be complete until the year 2010. This rulemaking would not affect airplanes utilized in accordance with Part 91 of the Federal Aviation Regulations (14 CFR part 91). The FAA has determined that as the general aviation fleet gets older, there is concern about ensuring the continued airworthiness of these airplanes.

In addition to these concerns, there are a large number of general aviation airplane manufacturers that have gone out of business or severely curtailed operations. The FAA is concerned about the less than optimum availability of resources to respond to any airworthiness problems on these airplanes. The FAA is aware that many of these "orphaned" airplanes are well supported by owner associations and spare parts manufacturers, but unfortunately, this support is not available in all cases.

The FAA has determined that it is in the public interest to hold a public meeting on this subject for the purpose of sharing information and gathering additional data. Accordingly, the FAA will conduct this public meeting in Kansas City, Missouri.

The FAA anticipates that the agency, industry, and the general public will use the public meeting as a forum to share information, resolve questions, and discuss potential solutions concerning the continued airworthiness of older general aviation airplanes.

Public Meeting Procedures

The following procedures have been established for this meeting:

1. Admission and participation in the public meeting is free. The meeting will be open to all persons who have requested in advance to present statements, or who register on the first day of the meeting (between 8:00 a.m. and 8:30 a.m.). Time availability for presentations and seating will be made according to the order of reservation.

2. Representatives from the FAA will conduct the public meeting. A technical panel of FAA personnel will discuss information presented by participants.

3. The public meeting is intended as a forum to share information and resolve questions concerning the continued airworthiness of older general aviation airplanes. Those sharing information will include industry, the general public, and operators of general aviation aircraft. Participants must limit their presentations to the issue.

4. All interested parties will have the opportunity to present any additional information not currently available to the FAA. The FAA will then have the opportunity to explain the methodology and technical assumptions supporting its current observations.

5. FAA personnel, industry, and public participants may engage in a full discussion of all technical material presented at the meeting. Anyone presenting conclusions will be expected to submit to the FAA data supporting those conclusions.

6. The FAA will try to accommodate all speakers. Time may be limited for each presentation.

7. Sign and oral interpretations will be made available at the meeting, including assistive listening devices, if requested 10 calendar days before the meeting.

8. The meeting (except for any breakout sessions) will be recorded by a court reporter. Any person who is interested in purchasing a copy of the

Recommendation Letter

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Pratt & Whitney
A United Technologies Company

December 17, 1999

Department of Transportation
Federal Aviation Administration
800 Independence Ave, SW
Washington, D.C. 20591

Attention: Mr. Tom McSweeny, Associate Administrator for Regulation and Certification

Reference: ARAC Tasking, Federal Register, November 26, 1999

Dear Tom,

In accordance with the reference tasking statement, the ARAC Transport Airplane and Engine Issues Group is pleased to forward the attached technical reports which provide ARAC's recommendations for FAR/JAR harmonization of the following rules:

25.147 (c)
25.253 (a)(3)
25.111 (c)(4)
25.161 (c)(2)
25.161 (e)
25.175 (d)
25.177 (a)(b)
25.1323 (c)
25.1527
25.1583 (c)
25.1583 (f)
25.1585
25.1587
25.1516

These reports have been prepared by the Flight Test Harmonization Working Group of the TAEIG.

Sincerely,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG
Phone: 860-565-9348, Fax 860-557-2277, M/S 162-24
Email: boltcr@pweh.com

cc: Dorenda Baker – FAA-NWR*
Tony Fazio – FAA. ARM-1*
Kristin Larson – FAA-NWR
Bob Park, Boeing*
*letter only

Acknowledgement Letter

MAR 15 2000

Mr. Craig Bolt
Assistant Chair, Transport Airplanes
and Engines Issues Group
400 Main Street
East Hartford, CT 06108

Dear Mr. Bolt:

This letter acknowledges receipt of the following working group technical reports that you have submitted on behalf of the Aviation Rulemaking Advisory Committee (ARAC) on Transport Airplane and Engine Issues (TAE):

Date of Letter	Task No.	Description of Recommendation	Working Group
12/14/00	1, 2, 3	Fast track reports addressing §§ 25.703(a) thru (c) (takeoff warning system); 25.1333(b) (instrument systems; and 25.1423(b) (public address system)	ASHWG
12/17/00	5	Fast track reports addressing §§ 25.111(c)(4), 25.147, controllability in 1-engine inoperative condition; 25.161 (c) (2) and (4), and (e) (longitudinal trim and airplanes with 4 or more engines) 25.175(d) (static longitudinal stability; 25.177(a)(b) (static lateral-directional stability); 25.253(a)(3) (high speed characteristics); 25.1323(c) (airspeed indicating system); 25.1516 (landing gear speeds); 25.1527 (maximum operating altitude); 25.1583(c) and (f) operating limitations) 25.1585 (operating procedures); and 25.1587 (performance information)	FTHWG
12/17/00	7	Fast track report addressing § 25.903(e) (inflight engine failures)	PPIHWG

12/20/00	5	Fast track reports addressing §§ 25.1103 (auxiliary power units); 25.933(a) (thrust reverers); 25.1189 (shutoff means); 25.1141 (powerplant controls); 25.1093 (air intake/induction systems); 25.1091 (air intake system icing protection; 25.943 (thrust reverser system tests); 25.934 (negative acceleration); 25.905(d) (propeller blade debris); 25.903(d)(1) (engine case burn-through); 25.901(d) (auxiliary power unit installation; and 1.1 (general definitions)	PPIHWG
12/20/00	4	Fast track report, category 2 format--NRRM addressing § 25.302 and appendix K (interaction of systems and structures	LDHWG
12/20/00	2	Fast track report—(in NPRM/AC format) addressing §§ 25.361 and 25.362 (engine and auxiliary power unit load conditions)	LDHWG
12/20/00	1	Fast track report addressing § 25.1438 (pressurization and low pressure pneumatic systems)	MSHWG

The above listed reports will be forwarded to the Transport Airplane Directorate for review. The Federal Aviation Administration's (FAA) progress will be reported at the TAE meetings.

This letter also acknowledges receipt of your July 28, 1999, submittal which included proposed notices and advisory material addressing lightning protection. We apologize for the delay. Although the lightning protection task is not covered under the fast track proposal, the FAA recognizes that technical agreement has been reached and we will process the package accordingly. The package has been sent to Aircraft Certification for review; the working group will be kept informed of its progress through the FAA representative assigned to the group.

Lastly, at the December 8 - 9, 1999, TAE meeting, Mr. Phil Salee of the Powerplant Installation Harmonization Working Group indicated that the working group members agreed that § 25.1103 was sufficiently harmonized and that any further action was beyond the scope of task 8 assigned. We agreed with the TAE membership to close the task. This letter confirms the FAA's action to close the task to harmonize § 25.1103.

I would like to thank the ARAC, particularly those members associated with TAE for its cooperation in using the fast track process and completing the working group reports in a timely manner.

Sincerely,

ORGINIAL SIGNED BY
ANTHONY F. FAZIO

Tony F. Fazio
Director, Office of Rulemaking

ARM-209:EUpshaw:fs:6/27/00:PCDOCS #12756v1
cc: ARM-1/20/200/209; APO-300/320, ANM-114
File #1340.12

File #ANM-98-182-A (landing gear shock absorption test requirements) and ANM-94-461-A (Taxi, takeoff, and landing roll design loads)

Recommendation

ARAC WG Report #1
Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25X1516

What is the underlying safety issue addressed by the FAR/JAR?:

There may be speeds above which it is unsafe to extend devices into the air stream, such as spoilers, speed brakes, ram air turbines, thrust reversers, and landing lights, or to open windows or doors. Limitations must be established and made available to the flightcrew to ensure safe operation.

What are the current FAR and JAR standards?: see below

Current FAR text:

None.

Current JAR text:

JAR 25X1516 Other speed limitations

Any other limitation associated with speed must be established. (See also ACJ 25X1516.)

What are the differences in the standards and what do these differences result in?:

The FAR does not have an explicit requirement to mandate that any other limitation associated with speed be established, while the JAR does. The FAR relies on § 25.1501(a), "Each operating limitation specified in §§25.1503 and 25.1533 **and other limitations and information necessary for safe operation must be established**," to accomplish the same goal. There are no practical differences resulting from the difference in the standards.

What, if any, are the differences in the means of compliance?:

FAA AC 25.1581-1 Airplane Flight Manual

Paragraph 2b(7)(vi)

(vi) Any other limiting speeds for extendable devices other than the landing gear should be included as applicable (e.g., spoilers, thrust reversers, landing lights, ram air turbines (RAT), windows that may be opened in flight, etc.).

ACJ 25X1516

Speed limitations for devices such as spoilers, speed brakes, high lift devices, thrust reversers, landing lights and the opening of doors and direct vision windows, should be included.

What is the proposed action?:

Harmonize to the JAR standard.

What should the harmonized standard be?:

See below

Proposed text of harmonized standard:

FAR/JAR 25.1516:

Any other limitation associated with speed must be established.

How does this proposed standard address the underlying safety issue?:

It continues to address the underlying safety issue by requiring the airspeed limitations to be established for devices that can open into the air stream in flight.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintain

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintain

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

This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?:

Manufacturers and operators of transport category airplanes could be affected by the proposed change. However, since the proposed change does not result in any practical changes in requirements, there will not be any effect.

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

None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?):

No additional advisory material is needed. The advisory material will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25. The JAA will delete ACJ 25X1516.

How does the proposed standard compare to the current ICAO standards?:

The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?:

No.

What is the cost impact of complying with the proposed standard?:

None.

Does the working group want to review the draft NPRM prior to publication in the *Federal Register*?:

Yes.

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

Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report #2
Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1527

What is the underlying safety issue addressed by the FAR/JAR?:

Operation outside the environmental envelope established for the airplane may be unsafe. Therefore, the boundaries of that envelope must be established to ensure safe operations.

What are the current FAR and JAR standards?: see below

Current FAR text:

Maximum operating altitude. The maximum altitude up to which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.

Current JAR text:

The **extremes of the ambient air temperature and operating altitude for** which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.

What are the differences in the standards and what do these differences result in?:

The FAR standard only requires the maximum altitude portion of the environmental envelope to be established. The JAR requires both the minimum and maximum altitudes and ambient temperatures to be established. FAA policy is consistent with the JAR standard (as shown in AC 25.1581-1), but must rely on the general provisions of § 25.1501(a) ("other limitations and information necessary for safe operation must be established") for its regulatory basis.

What, if any, are the differences in the means of compliance?:

Although the explicit standards are different, there are no differences in the means of compliance. The FAA relies on the general provisions of § 25.1501(a) and the following AC 25-7A advisory material to apply the same requirement. There is no current JAA advisory material; however, the JAA will be adopting AMJ 25.1581 with Change 15 to JAR-25. AMJ 25.1581 is harmonized with FAA AC 25.1581-1.

FAA AC 25.1581-1 (paragraph 2b(3)):

(3) Operating Limitations. The extremes of the operational variables, including any appropriate descriptions for which compliance with parts 25 and 36 has been shown and for which the AFM data have been approved, should be listed with respect to the following:

(i) Operations.

(A) Maximum takeoff, landing, and zero fuel weight limits.

(B) Minimum in-flight gross weight.

(C) Minimum and maximum pressure altitude for which operation is limited for each flight phase (takeoff, en route, and landing). Further altitude limitations caused by changes to structure, powerplant, equipment characteristics, or flight characteristics (e.g., due to failures) should be provided.

(D) Ambient atmospheric temperature (maximum and minimum).

What is the proposed action?:

Codify current FAA policy by harmonizing to the JAR standard.

What should the harmonized standard be?:

See below

Proposed text of harmonized standard:

FAR/JAR 25.1527:

The extremes of the ambient air temperature and operating altitude for which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.

How does this proposed standard address the underlying safety issue?:

It continues to address the underlying safety issue in the same manner by codifying current FAA policy to harmonize with the JAR.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintain.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintain.

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

This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?:

Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it codifies current practices and policy.

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

None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?):

Current advisory material is adequate. The advisory material will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?:

The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?:

No.

What is the cost impact of complying with the proposed standard?:

None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?:

Yes.

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

Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report #3
Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1583(c)

What is the underlying safety issue addressed by the FAR/JAR?:

Section/JAR 25.1583 is linked to §§/JAR 25.1501 through 25.1533 in that it requires the limitations established under those sections to be provided in the Airplane Flight Manual. To ensure safe operation, any limitations established for the airplane must be made known to the flightcrew. This is accomplished through instrument markings and placards, and the information provided in the Airplane Flight Manual.

What are the current FAR and JAR standards?:

Current FAR text:

25.1583(c): *Weight and loading distribution.* The weight and center of gravity limits required by §§ 25.25 and 25.27 must be furnished in the Airplane Flight Manual. All of the following information must be presented either in the Airplane Flight Manual or in a separate weight and balance control and loading document which is incorporated by reference in the Airplane Flight Manual:

(1) The condition of the airplane and the items included in the empty weight as defined in accordance with § 25.29.

(2) Loading instructions necessary to ensure loading of the airplane within the weight and center of gravity limits, and to maintain the loading within these limits in flight.

(3) If certification for more than one center of gravity range is requested, the appropriate limitations, with regard to weight and loading procedures, for each separate center of gravity range.

Current JAR text:

25.1583(c): *Weight and loading distribution.* The weight and centre of gravity limitations established under JAR 25.1519 must be furnished in the aeroplane Flight Manual. All the following information including weight distribution limitations established under JAR 25.1519 must be presented either in the aeroplane Flight Manual or in a separate weight and balance control and loading document which is incorporated by reference in the aeroplane Flight Manual (see ACJ 25.1583(c));

(1) The condition of the aeroplane and the items included in the empty weight as defined in accordance with JAR 25.29.

(2) Loading instructions necessary to ensure loading of the aeroplane within the weight and centre of gravity limits, and to maintain the loading within these limits in flight.

(3) If certification for more than one centre of gravity range is requested, the appropriate limitations, with regard to weight and loading procedures, for each separate centre of gravity range.

What are the differences in the standards and what do these differences result in?:

There are no practical differences in application of the standards. However, the JAR standard is more correct by referring to the requirement that establishes the weight and loading distribution limits as

operating limitations. Section/JAR 25.1519 contains the requirement to establish the limitations determined under §/JAR 25.23 to 25.27 as operating limitations.

JAR 25.1583(c) requires the operating limitations established under JAR 25.1519 to be provided in the Airplane Flight Manual. Instead of referencing § 25.1519, § 25.1583(c) specifically refers to the weight and center of gravity limitations determined under §§ 25.25 and 25.27. This mistakenly excludes any operating limitations established as a result of § 25.23.

What, if any, are the differences in the means of compliance?:

Although the explicit standards are different, there are no differences in the means of compliance. The FAA relies on the general provisions of § 25.1501(a) and the following AC 25-1581-1 advisory material to apply the same requirement. The JAA have a current ACJ that is relevant; however, the JAA will be adopting harmonized advisory material with Change 15 to JAR-25.

FAA AC 25.1581-1 (paragraphs 2b(1) and 2e):

2(b)(1) *Weight Limitations.* A statement of the maximum certified takeoff and landing weights must be provided. The maximum taxi/ramp weight, maximum zero fuel weight, and any other fixed limit on weight should also be included. Any limitations on airplane loading associated with the stated weight limitations must be included in the AFM or addressed in a separate weight and balance document. Separate takeoff and landing weight limits may be listed corresponding to each applicable constraint (e.g., structural or noise requirements, customer option, etc.), if the instructions in the Limitations Section clearly state that the most restrictive of these takeoff and landing weight limitations represent the maximum certified weights.

(i) For those performance weight limits that vary with runway length, altitude, temperature, or other variables, the variation in weight limitations may be presented as graphs in the Performance Section of the AFM and included as limitations by specific reference in the Limitations Section.

(ii) Only one set of takeoff and landing gross weight limits may be established under part 36 for a specific airplane model (i.e., hardware build).

. . .

e. Loading Instructions. Section 25.1583 requires instructions necessary to ensure loading of the airplane within the established limits of weight and center-of-gravity, and to maintain the loading within such limits in flight to be presented either in the AFM or included in a separate weight and balance document referenced in the AFM Limitations Section. If applicable, the loading instructions must refer to the flight procedures that consider the change to the airplane's center of gravity as fuel is consumed.

(1) Loading Instructions Presented in a Separate Document. If the loading instructions are presented in a separate document, the AFM Limitations Section should contain at least the following:

(i) Maximum taxi gross weight limits.

(ii) Maximum takeoff gross weight limits.

(iii) Maximum landing gross weight limits.

(iv) Maximum zero fuel weight limits.

(v) Minimum in-flight gross weight.

(vi) Center-of-gravity limits.

(vii) Information required to maintain the airplane within the above limits.

(2) Weight and Balance Data. Documentation of the weight and balance material outlined below is normally adequate for airplanes with conventional loading and fuel management techniques. For airplanes that require fuel to be redistributed (other than through normal consumption) to maintain loading within prescribed limits, the loading instructions should be expanded as necessary.

(i) Weight Limits. A list and identification of all weight limitations should be included.

(ii) Center-of-Gravity Limits. The approved center-of-gravity range, or ranges, should be presented with due accounting for airplane configuration (i.e., landing gear position, passenger loading, cargo distribution, etc.) such that loading limits can be maintained.

(iii) Dimensions, Datum, and MAC. The dimensions and relative location of airplane features associated with weighing and loading of the airplane and with weight and balance computations should be described or illustrated.

(iv) Configuration Checklist or Equipment List. The airplane should be defined or described sufficiently to identify the presence or absence of optional systems, features, or installations that are not readily apparent. In addition, all other items of fixed or removable equipment included in the empty weight should be listed.

(v) Fuel and Other Liquids. All fuel and other liquids, including passenger-service liquids, that are included in the empty weight should be identified and listed, together with the information necessary to enable ready duplication of the particular condition.

(vi) Weighing Computations. Computation of the empty weight and the empty weight c.g. location should be included.

(vii) Loading Schedule. The loading schedule should be included, if appropriate.

(viii) Loading Instructions. Complete instructions relative to the loading procedure or to the use of the loading schedule should be included.

(ix) Compartment and floor load limits should be included.

JAA ACJ 25.1583(c):

1. Indication should be given in tabular or graphic form of the c.g. limits for take-off and landing and for any other practicably separable flight condition, as appropriate for the range of weights between the maximum take-off weight and the minimum landing weight presented in accordance with JAR 25.1583(c). The landing gear position appropriate to each condition should be shown, or, alternatively, data should be presented for landing-gear-extended position only and should include the moment change due to gear retraction. C.g. limits should be presented in terms of both distance-from-datum and percentage of the mean aerodynamic chord (MAC). The datum for the former should be defined and the length and location of the MAC should be stated.
2. For those weight limitations which vary with runway length, altitude, temperature and other variables the variation in weight limitation may be presented as graphs in the performance section of the Flight Manual, and included as limitations by specific reference, in the limitations section, to the appropriate graph or page.

What is the proposed action?:

Codify current FAA policy by harmonizing to the JAR standard.

What should the harmonized standard be?:

FAR/JAR 25.1583(c):

Weight and loading distribution. The weight and center of gravity limitations established under §/JAR 25.1519 must be furnished in the Airplane Flight Manual. All of the following information, including the weight distribution limitations established under §/JAR 25.1519, must be presented either in the Airplane Flight Manual or in a separate weight and balance control and loading document that is incorporated by reference in the Airplane Flight Manual;

(1) The condition of the airplane and the items included in the empty weight as defined in accordance with §/JAR 25.29.

(2) Loading instructions necessary to ensure loading of the airplane within the weight and center of gravity limits, and to maintain the loading within these limits in flight.

(3) If certification for more than one center of gravity range is requested, the appropriate limitations, with regard to weight and loading procedures, for each separate center of gravity range.

How does this proposed standard address the underlying safety issue?:

It continues to address the underlying safety issue in the same manner by codifying current FAA policy to harmonize with the JAR.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintain.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintain.

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

No other options were considered.

Who would be affected by the proposed change?:

Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it codifies current practices and policy.

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

None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?):

Existing FAA advisory material is adequate. The JAA intend to delete their ACJ when the harmonized JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?:

The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?:

No.

What is the cost impact of complying with the proposed standard?:

None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?:

Yes.

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

Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report #4
Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1583(f)

What is the underlying safety issue addressed by the FAR/JAR?:

Section/JAR 25.1583 is linked to §§/JAR 25.1501 through 25.1533 in that it requires the limitations established under those sections to be provided in the Airplane Flight Manual. To ensure safe operation, any limitations established for the airplane must be made known to the flightcrew. This is accomplished through instrument markings and placards, and the information provided in the Airplane Flight Manual.

What are the current FAR and JAR standards?:

Current FAR text:

Altitudes. The altitude established under § 25.1527.

Current JAR text:

Ambient air temperatures and operating altitudes. The extremes of the ambient air temperatures and operating altitudes established under JAR 25.1527 and an explanation of the limiting factors must be furnished.

What are the differences in the standards and what do these differences result in?:

Consistent with § 25.1527, the FAR standard only requires the maximum altitude portion of the environmental envelope to be provided in the Airplane Flight Manual. Consistent with JAR 25.1527, the JAR requires both the minimum and maximum altitudes and ambient temperatures to be established. FAA policy is consistent with the JAR standard (as shown in AC 25.1581-1), but must rely on the general provisions of § 25.1501(a) ("other limitations and information necessary for safe operation must be established") for its regulatory basis.

What, if any, are the differences in the means of compliance?:

Although the explicit standards are different, there are no differences in the means of compliance. The FAA relies on the general provisions of § 25.1501(a) and the following AC 25.1581-1 advisory material to apply the same requirement. There is no current JAA advisory material, but AMJ 25.1581 is harmonized with FAA AC 25.1581-1 and will be published as part of Change 15 to JAR-25.

FAA AC 25.1581-1 (paragraph 2b(3)):

(3) *Operating Limitations.* The extremes of the operational variables, including any appropriate descriptions for which compliance with parts 25 and 36 has been shown and for which the AFM data have been approved, should be listed with respect to the following:

(i) Operations.

(A) Maximum takeoff, landing, and zero fuel weight limits.

(B) Minimum in-flight gross weight.

(C) **Minimum and maximum pressure altitude for which operation is limited for each flight phase (takeoff, en route, and landing). Further altitude limitations caused by**

changes to structure, powerplant, equipment characteristics, or flight characteristics (e.g., due to failures) should be provided.

(D) **Ambient atmospheric temperature (maximum and minimum).**

What is the proposed action?:

Codify current FAA policy by harmonizing to the JAR standard. The requirement for an explanation of the limiting factors would be deleted; however, as this does not represent current practice and is unnecessary for safety.

What should the harmonized standard be?:

see below

Proposed text of harmonized standard:

FAR/JAR 25.1583(f):
Ambient air temperatures and operating altitudes. The extremes of the ambient air temperatures and operating altitudes established under §/JAR 25.1527 must be furnished.

How does this proposed standard address the underlying safety issue?:

It continues to address the underlying safety issue in the same manner by codifying current FAA policy to harmonize with the JAR.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintain.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintain.

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

This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?:

Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it codifies current practices and policy.

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

None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?):

Existing FAA advisory material is adequate. The advisory material will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?:

The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?:

No.

What is the cost impact of complying with the proposed standard?:

None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?:

Yes.

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

Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report #5
Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1585

What is the underlying safety issue addressed by the FAR/JAR?:

The primary purpose of the Airplane Flight Manual is to provide an authoritative and approved source of information considered necessary for safely operating the airplane. Consistent with this purpose, operating procedures related to airworthiness and necessary for safe operation, including those procedures that may be unique to that type of airplane, must be provided in the Airplane Flight Manual.

What are the current FAR and JAR standards?:

Current FAR text:

§ 25.1585 Operating procedures.

(a) Information and instructions regarding the peculiarities of normal operations (including starting and warming the engines, taxiing, operation of wing flaps, landing gear, and the automatic pilot) must be furnished, together with recommended procedures for--

(1) Engine failure (including minimum speeds, trim, operation of the remaining engines, and operation of flaps);

(2) Stopping the rotation of propellers in flight;

(3) Restarting turbine engines in flight (including the effects of altitude);

(4) Fire, decompression, and similar emergencies;

(5) Ditching (including the procedures based on the requirements of §§ 25.801, 25.807(d), 25.1411, and 25.1415(a) through (e));

(6) Use of ice protection equipment;

(7) Use of fuel jettisoning equipment, including any operating precautions relevant to the use of the system;

(8) Operation in turbulence for turbine powered airplanes (including recommended turbulence penetration airspeeds, flight peculiarities, and special control instructions);

(9) Restoring a deployed thrust reverser intended for ground operation only to the forward thrust position in flight or continuing flight and landing with the thrust reverser in any position except forward thrust; and

(10) Disconnecting the battery from its charging source, if compliance is shown with Sec. 25.1353(c)(6)(ii) or (c)(6)(iii).

(b) Information identifying each operating condition in which the fuel system independence prescribed in § 25.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(c) The buffet onset envelopes, determined under § 25.251 must be furnished. The buffet onset envelopes presented may reflect the center of gravity at which the airplane is normally loaded during cruise if corrections for the effect of different center of gravity locations are furnished.

(d) Information must be furnished which indicates that when the fuel quantity indicator reads "zero" in level flight, any fuel remaining in the fuel tank cannot be used safely in flight.

(e) Information on the total quantity of usable fuel for each fuel tank must be furnished.

Current JAR text:

JAR 25.1585 Operating procedures

(a) Information and instructions regarding operating procedures must be furnished (see ACJ 25.1585(a)) in substantial accord with the categories described below –

(1) Emergency procedures which are concerned with foreseeable but unusual situations in which immediate and precise action by the crew, as detailed in the recommended procedures, may be expected to reduce the risk of catastrophe.

(2) Other procedures peculiar to the particular type or model encountered in connection with routine operations including malfunction cases and failure conditions, involving the use of special systems and/or the alternative use of regular systems not considered as emergency procedures.

(b) Information or procedures not directly related to airworthiness or not under the control of the crew, must not be included, nor must any procedure which is accepted as basic airmanship.

(c) The buffet onset envelopes, determined under JAR 25.251 must be furnished. The buffet onset envelopes presented may reflect the centre of gravity at which the aeroplane is normally loaded during cruise if corrections for the effect of different centre of gravity locations are furnished. (See ACJ 25.1585(c).)

(d) Information must be furnished which indicates that when the fuel quantity indicator reads "zero" in level flight, any fuel remaining in the fuel tank cannot be used safely in flight.

(e) Information on the total quantity of usable fuel for each fuel tank must be furnished.

What are the differences in the standards and what do these differences result in?:

The JAR does not include § 25.1585(b), the requirement that information identifying each operating condition in which the fuel system independence prescribed in § 25.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section. Lack of such information may compromise the intent of the rules regarding fuel system independence.

JAR 25.1585(a) and (b) essentially update the § 25.1585(a) requirements to better reflect current policy, practices, and interpretations. These differences are not thought to cause any material differences in technical requirements for procedural information in the Airplane Flight Manual. Any differences in this area are thought to result more from means of compliance and interpretation differences, which have recently been addressed by harmonizing the advisory material for compliance, FAA AC 25.1581-1 and JAA AMJ 25.1581.

What, if any, are the differences in the means of compliance?:

The advisory material related to the operating procedures section of the Airplane Flight Manual are reprinted below. Although there are differences between the texts of the FAA AC and the JAA ACJ's, the JAA will be adopting harmonized advisory material with Change 15 to JAR-25.

FAA AC 25.1581 (paragraph 2c):

c. Operating Procedures Section. The Operating Procedures Section of the AFM should contain, as a minimum, the essential information, peculiar to the particular airplane type or model, that is needed for safe operation under normal and other than normal conditions. Procedures not directly related to airworthiness, or not under control of the flightcrew, should not be included in the AFM. A notation similar to the following should be placed at the beginning of the Operating Procedures Section:

The operating procedures contained in this manual have been developed and recommended by the manufacturer and approved by the FAA for use in operating this airplane. These procedures are provided as guidance and should not be construed as prohibiting the operator from developing equivalent procedures in accordance with the applicable operating rules.

(1) Procedures Categories. Information should be presented for normal and non-normal/emergency procedures and be distinctly separated. The non-normal/emergency procedures may either be placed in one section or in separate non-normal and emergency procedures sections of the AFM. In either case, procedural tasks that are considered recall or immediate action items that must be accomplished from memory should be clearly identified.

(2) Format. Procedures should be presented in either a narrative or a checklist format, depending upon the intended use of the AFM.

(i) Narrative. This format is acceptable if sources of procedures information other than the AFM are intended for flightcrew use (e.g., a Flightcrew Operating Manual (FCOM)). Procedures presented in this format should be drafted in a manner from which the needed sequence can be easily established.

(ii) Checklist. This format should be used if the AFM is intended to be used directly by the flightcrew for operating procedures.

(3) Procedures Development. Prior to initial type certification, it is essential to verify that the proposed procedures are technically valid and operationally practicable. It is recognized that such procedures may have had only limited operational exposure at the time of certification and may need to be revised based on service experience.

(4) Procedures Content. The content and level of detail for the normal and non-normal procedures provided in the AFM should be based on the intended use of the AFM. More information and detail should be provided in AFMs that are intended to be the flightcrew's primary source of operating procedures information than for AFMs that are not intended to be used directly by the flightcrew.

(i) General. Classifying an operating procedure as normal or non-normal should reflect whether the airplane's systems are operating normally. Procedures associated with failed or inoperative systems should be considered non-normal. Procedures associated with glideslope deviation, ground proximity warning, all-engines-operating go-around, turbulent air penetration, windshear alerts, traffic advisories or resolution alerts from the traffic alerting and collision avoidance system, etc., which do not occur routinely, should be placed in the normal procedures subsection, provided the airplane's systems are operating normally.

(ii) Other Sources of Procedures Information. The flightcrew of large transport category airplanes typically use sources of operating procedures information other than the AFM. Examples of other sources of operating procedures information include manufacturer- or operator-produced operating manuals, Quick Reference Handbooks (QRH's), System Pilot's Guides, and Emergency or Abnormal Checklists. For these airplanes, items such as cockpit checklists, systems descriptions, and the associated normal procedures should not be presented in the AFM if they are provided in other documents acceptable to the FAA. Normal procedures that are necessary for safe operation should be presented in the

AFM, but the remaining normal procedures should be placed in the manufacturer-produced FCOM (or other acceptable source of operating procedures information). The non-normal procedures section of the AFM for these types of airplanes should include, as a minimum, procedures dictated by the airplane's systems and failure modes, and may also include those emergency procedures listed in paragraph 2c(5) of this AC.

(A) The system description and procedures provided in the AFM should be limited to that which is uniquely related to airplane safety or airworthiness. The AFM should include a brief general description of the system and its intended use. The limitations section of the AFM should reference the operating manual in which the detailed system description and procedures can be found. This reference should include the document title, the document or part number, and the date of issue, and may allow the use of later appropriate revisions. An example wording would be: "The *Manufacturer Unit Model* System Pilot's Guide, P/N XXXX, dated XXXX (or later appropriate revision) must be immediately available to the flightcrew whenever XXXX [e.g., navigation] is predicated on the use of the system. The software version [if applicable] stated in the Pilot's Guide must match that displayed on the equipment."

(B) Information that restricts or defines the operation of a particular system (e.g., authorizing or prohibiting specific types of approaches) should be located in the limitations section of the AFM. Emergency or abnormal procedures should be located in the appropriate procedures section(s) of the AFM.

(C) Detailed system descriptions and normal procedures that represent one means, but not the only means, of operation should be located in appropriate operating manuals with a reference placed in the procedures section of the AFM. This reference should include the document title, the document or part number, and the date of issue. The reference may also allow the use of later appropriate revisions of that document. An example wording would be: "Normal operating procedures are contained in the *Manufacturer Unit Model* System Pilot's Guide, P/N XXXX, dated XXXX (or later appropriate revision)."

(iii) AFM Used Directly. For those manufacturers and operators that do not produce other sources of procedures information (generally manufacturers and operators of small transports), the AFM is the only source of this information. In this circumstance, the AFM operating procedures information must be comprehensive and include information such as cockpit checklists, systems descriptions, and associated procedures.

(5) Emergency Procedures. The emergency procedures can be included either in a dedicated section of the AFM or in the non-normal procedures section. In either case, this section should include the procedures for handling any situation that is in a category similar to the following:

(i) Engine failure with severe damage or separation.

(ii) Multiple engine failure.

(iii) Fire in flight.

(iv) Smoke control. At least the following should be clearly stated in the AFM:

After conducting the fire or smoke procedures, land at the nearest suitable airport, unless it is visually verified that the fire has been extinguished.

(v) Rapid decompression.

(vi) Emergency descent.

(vii) Uncommanded reverser deployment in flight.

(viii) Crash landing or ditching.

(ix) Emergency evacuation.

JAA ACJ 25.1585(a):

1 In furnishing information and instructions, consideration should be given to the following. The lists do not necessarily include all items to be considered for a given aeroplane. The categorisation of certain items may need to be modified because of design features or other considerations.

2 *Emergency Procedures*

a. Engine and APU fire/separation/severe damage

b. Smoke or fire in cockpit/cabin/cargo compartment

c. Rapid decompression/emergency descent

d. Landing or go-around with jammed stabiliser

e. Runaway stabiliser

f. Flight with all engines inoperative

g. Ditching

3 *Other Procedures*

a. Engine starting

b. APU operation

c. Fuel management. The effect on unusable fuel quantity due to fuel booster pump failure should be stated.

d. Reverse thrust system.

e. Navigation system

f. Rain repellent system

g. Automatic flight control systems

h. Cabin pressurisation system

i. Oxygen system

j. Hydraulic system

k. Electrical system

l. Anti-ice/de-ice system

m. Operation in turbulence

n. Equipment cooling

o. Flight controls

p. Stall warning/stall identification system

q. Braking system

r. Fuel dumping

s. Go-around with minimum fuel

t. Landing in abnormal configurations

u. Engine shut-down and relight in flight

v. Approach and landing with engine(s) inoperative

w. Go-around with engine(s) inoperative

x. Landing gear alternate operation

4 Certain items listed in 3 may also need to be considered under 2.

5 Observance of these procedures may not be mandatory and approval of such procedures is not intended to prohibit or discourage development and use of improved or equivalent procedures based on operational experience with the aeroplane.

6 The procedures to be followed by the flight crew in the event of an engine fire, severe damage or separation of the engine should be similar, and should include identification of the failed engine as the primary action as far as the powerplant is concerned.

ACJ 25.1585(c):

The buffet onset envelopes should be accompanied by information of the maximum altitude at which it is possible to achieve a positive normal acceleration increment of 0.3 g without exceeding the buffet onset boundary, at any given combination of weight, centre of gravity location and airspeed. (See also ACJ 25.251(e).)

ACJ 25.251(e):

2 *Range of Load Factor for Normal Operations*

2.1.1 JAR 25.251(e) requires that the envelopes of load factor, speed, altitude and weight must provide a sufficient range of speeds and load factors for normal operations.

2.1.2 An acceptable means of compliance with the requirement is to establish the maximum altitude at which it is possible to achieve a positive normal acceleration increment of 0.3 g without exceeding the buffet onset boundary. See also ACJ 25.1585(c).

What is the proposed action?:

Harmonize to a standard using the FAR text for 25.1585(b) (the more stringent standard), and the JAR text for the rest of the section (with some editorial changes to simplify the text and make it better reflect current practices as exemplified by the AC/AMJ 25.1581 advisory material). Although the FAR text for § 25.1585(a)/JAR 25.1585(a) and (b) could be considered to be more stringent by virtue of its being more specific as to the procedures that must be furnished in the Airplane Flight Manual, it is considered outdated and not completely consistent with current practices. Some of the mandated procedures are no longer appropriate and other important procedures are not included. The proposed standard is intended to provide a better description of what types of procedures are required to be in the Airplane Flight Manual, the specifics of which will depend on the particular design. Current advisory material lists specific procedures corresponding to the general requirement that may be appropriate to include, depending on the design.

What should the harmonized standard be?:

FAR/JAR 25.1585:

(a) Operating procedures must be furnished for –

(1) Normal procedures peculiar to the particular type or model encountered in connection with routine operations;

(2) Non-normal procedures for malfunction cases and failure conditions involving the use of special systems or the alternative use of regular systems; and

(3) Emergency procedures for foreseeable but unusual situations in which immediate and precise action by the crew may be expected to substantially reduce the risk of catastrophe.

(b) Information or procedures not directly related to airworthiness or not under the control of the crew, must not be included, nor must any procedure that is accepted as basic airmanship.

(c) Information identifying each operating condition in which the fuel system independence prescribed in §/JAR 25.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(d) The buffet onset envelopes, determined under §/JAR 25.251 must be furnished. The buffet onset envelopes presented may reflect the center of gravity at which the airplane is normally loaded during cruise if corrections for the effect of different center of gravity locations are furnished.

(e) Information must be furnished that indicates that when the fuel quantity indicator reads "zero" in level flight, any fuel remaining in the fuel tank cannot be used safely in flight.

(f) Information on the total quantity of usable fuel for each fuel tank must be furnished.

How does this proposed standard address the underlying safety issue?:

It continues to address the underlying safety issue in the same manner by requiring information and procedures necessary for airworthiness and operational safety to be furnished in the Airplane Flight Manual.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintains the same level of safety.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintains the same level of safety.

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

This item was proposed as an enveloping item. Harmonizing to the most stringent standard could be interpreted as harmonizing to the FAR standard (see discussion of differences above), but the JAR standard for the proposed §§/JAR 25.1585(a) and 25.1585(b) is considered to be closer to current practices and the manner in which § 25.1585(a) is actually applied.

Who would be affected by the proposed change?:

Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it is consistent with current regulatory requirements, practices and policy.

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

None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?):

Existing FAA advisory material is adequate. The advisory material associated with §/JAR 25.1585 will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?:

The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?:

No.

What is the cost impact of complying with the proposed standard?:

None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?:

Yes.

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

Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report #6
Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1587

What is the underlying safety issue addressed by the FAR/JAR?:

The primary purpose of the Airplane Flight Manual is to provide an authoritative and approved source of information considered necessary for safely operating the airplane. Consistent with this purpose, performance information related to airworthiness and necessary for safe operation must be provided in the Airplane Flight Manual.

What are the current FAR and JAR standards?:

Current FAR text:

§ 25.1587 Performance information.

(a) Each Airplane Flight Manual must contain information to permit conversion of the indicated temperature to free air temperature if other than a free air temperature indicator is used to comply with the requirements of § 25.1303(a)(1).

(b) Each Airplane Flight Manual must contain the performance information computed under the applicable provisions of this part for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable within the operational limits of the airplane, and must contain the following:

(1) The conditions under which the performance information was obtained, including the speeds associated with the performance information.

(2) V_S determined in accordance with § 25.103.

(3) The following performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights):

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

(4) Procedures established under § 25.101(f), (g) and (h) that are related to the limitations and information required by § 25.1533 and by this paragraph. These procedures must be in the form of guidance material, including any relevant limitations or information.

(5) An explanation of significant or unusual flight or ground handling characteristics of the airplane.

Current JAR text:

JAR 25.1587 Performance information

(a) Not required for JAR-25

(b) Each aeroplane Flight Manual must contain the performance information computed under the applicable provisions of this JAR-25 (including JAR 25.115, 25.123 and 25.125 for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable) within the operational limits of the aeroplane, and must contain the following:

(1) The condition of power, configuration, speeds and the procedures for handling the aeroplane and any system having a significant effect on performance upon which the performance graphs are based must be stated in each case. (See ACJ 25.1587(b)(1).)

(2) Not required for JAR-25 as this sub-paragraph is covered by the opening sentence of sub-paragraph (b).

(3) The following gross performance information (determined by extrapolation and computed for the range of weights between the maximum landing weight and maximum takeoff weight) must be provided:

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

(4) Procedures established under § 25.101 (f) and (g) that are related to the limitations and information required by JAR 25.1533 and by this paragraph must be stated in the form of guidance material, including any relevant limitation or information.

(5) An explanation of significant or unusual flight or ground handling characteristics of the aeroplane.

(6) Corrections to indicated values of airspeed, altitude and outside air temperature.

(7) An explanation of operational landing runway length factors included in the presentation of the landing distance, if appropriate. (See ACJ 25.1587(b)(7).)

What are the differences in the standards and what do these differences result in?:

The JAR does not include § 25.1587(a) or § 25.1587(b)(2). The FAR does not include JAR 25.1587(b)(6) or 25.1587(b)(7). The JAR also contains some wording differences that primarily reflect an updating of the FAR wording to better reflect current interpretations and practices. These differences are not thought to cause any material differences in technical requirements for performance information in the Airplane Flight Manual. Any differences in this area are thought to result more from means of compliance and interpretation differences, which have recently been addressed by harmonizing the advisory material for compliance, FAA AC 25.1581-1 and JAA AMJ 25.1581.

What, if any, are the differences in the means of compliance?:

The advisory material related to the operating procedures section of the Airplane Flight Manual are reprinted below. Although there are differences between the texts of the FAA AC and the JAA ACJ's, the FAA AC represents a harmonized text. The JAA are in the process of publishing the JAA equivalent to the FAA AC as AMJ 25.1581. The ACJ's will be removed upon publication of this AMJ.

FAA AC 25.1581-1 (paragraph 2d):

d. Performance Section. This section of the AFM contains the performance limitations and other data required by parts 25 and 36, and any special conditions that may apply. Additional information may be provided to assist the operator in complying with the operating rules or for implementing unique operational needs. The performance information should cover the operating range of weights, altitudes, temperatures, airplane configurations, thrust ratings, and any other operational variables stated as operational performance limitations for the airplane. If additional performance information is presented for operation at a specific altitude, these performance data should cover a pressure altitude span of at least the specific altitude ±1,000 feet to allow an

operator to adequately account for pressure altitude variations. It is recommended that such data be included as a separate section or appendix to the AFM.

(1) **General**. Include all descriptive information necessary to identify the configuration and conditions for which the performance data are applicable. Such information should include the type or model designations of the airplane and its engines, the approved flap settings, a brief description of airplane systems and equipment that affect performance (e.g., anti-skid, automatic spoilers, etc.), and a statement indicating whether such systems and equipment are operative or inoperative. This section should also include definitions of terms used in the Performance Section (e.g., IAS, CAS, ISA, configuration, net flight path, icing conditions, etc.), plus calibration data for airspeed (flight and ground), Mach number, altimeter, air temperature, and other pertinent information. The airspeed, altitude, and air temperature calibration data should be presented for the following ranges:

(i) Takeoff configurations:

(A) Ground run, 0.8 V_{1MIN} to V_{2MAX}

(B) Inflight, V_{2MIN} to V_{FE}

(ii) Approach and landing configurations:

(A) Approach, 1.2 V_S to V_{FE}

(B) Landing, 1.3 V_S to V_{FE}

(iii) En route configuration:

(A) Airspeed and Altimeter: For the takeoff/takeoff path altitude range, 1.25 V_S to V_{MO}/M_{MO}.

(B) Airspeed and Altimeter: For higher altitudes, from 1.25 V_S or the speed for 1.2g buffet onset margin, whichever is lower, to V_{MO}/M_{MO}.

(C) Mach Number: From the lowest useful Mach number (generally in the range of 0.4 to 0.5) to M_{MO}.

(D) Total or Static Air Temperature: For Mach numbers corresponding to the speed ranges noted in paragraphs 2d(1)(iii)(A) and (B) of this AC.

(2) **Performance Procedures**. The procedures, techniques, and other conditions associated with the AFM performance data should be included. Performance procedures may be presented as a performance subsection or in connection with a particular performance graph. In the latter case, a comprehensive listing of the conditions associated with the particular performance data may serve as procedures if sufficiently complete. The AFM should also include adequate information to enable the operator to show compliance with § 25.1001 for each takeoff.

(3) **Thrust or Power Setting**. Thrust or power settings should be provided for at least takeoff, maximum continuous, and go-around thrust or power, along with the thrust or power setting procedures necessary to obtain the performance shown in the AFM. These data should be shown for each applicable thrust or power setting parameter. If backing the airplane by reverse thrust or power is proposed, thrust or power setting limits should be established considering contaminated runway, foreign object damage potential, environmental control system impact, airplane weight and c.g., cockpit visibility, effect of braking, etc.

(4) **Minimum Control Speeds**. Minimum control speed data may be located in the Performance Section with a reference in the Limitations Section as to its location.

(5) **Stall Speeds**. The stall speeds established in showing compliance with certification requirements should be presented, together with associated conditions. Data should be presented in terms of calibrated airspeed.

(6) **Takeoff Speeds**. The takeoff speeds, V_1, V_R, and V_2, must be presented in the AFM, together with the associated conditions. These speeds should be presented in units consistent with cockpit instrument indications. V_1 and V_R speeds should be based upon ground effect calibration data, while V_2 speeds should be based upon free air calibration data. The takeoff speeds associated with the minimum control speeds and the maximum energy absorption capability of the brakes should be included. At the option of the applicant, the AFM may also include the V_1 speeds associated with unbalanced field lengths. At all conditions and airplane configurations represented in the AFM (i.e., at all altitudes, temperatures, weights, winds, runway slopes, flap settings, etc.), the accuracy of the V_1 speed should either: 1) be within 1.5 knots of the V_1 speed used to calculate the takeoff and accelerate-stop distances, or 2) not cause an increase to these distances of more than the greater of 100 feet or the incremental increase resulting from a 1.5 knot variation in V_1 speed.

(7) **Takeoff and Accelerate-Stop Distances**. Takeoff and accelerate-stop distances, complying with §§ 25.105, 25.109 and 25.113, must be provided. At the option of the applicant, and with concurrence by the FAA, additional data may be provided for operations on other than smooth hard-surfaced runways.

(8) **Climb Limited Takeoff Weight**. The climb limited takeoff weight, which is the most limiting weight showing compliance with §§ 25.121(a), (b), and (c), must be provided.

(9) **Miscellaneous Takeoff Weight Limits**. Takeoff weight limits should be shown for any equipment or characteristic of the airplane that imposes an additional takeoff weight restriction (e.g., maximum tire speed, maximum brake energy, fuel jettison considerations, inoperative system(s), etc.).

(10) **Takeoff Climb Performance**. For the prescribed takeoff climb airplane configurations, the climb gradients must be presented, together with associated conditions. The scheduled climb speed(s) should be included.

(11) **Takeoff Flight Path Data**. Takeoff flight paths, or performance information necessary to construct such paths, together with the associated conditions (e.g., procedures and speeds), should be presented for each approved takeoff configuration. The presentation should include all flight path segments existing between the end of the takeoff distance and the end of the takeoff path, as defined in § 25.111(a). Such data must be based upon net performance, as prescribed in §§ 25.115(b) and (c).

(12) **En Route Flight Path Data**. The net flight path gradient data prescribed in § 25.123 must be presented, together with the associated conditions (e.g., procedures and speeds). Data must be presented for both one- and two-engines-inoperative cases, as applicable, throughout the approved operating altitude and temperature envelope.

(13) **Climb Limited Landing Weight**. The climb limited landing weight, which is the most limiting weight showing compliance with §§ 25.119 and 25.121(d), should be provided.

(14) **Miscellaneous Landing Weight Limits**. Landing weight limits for any equipment or characteristic of the airplane configuration that imposes an additional landing weight restriction should be shown.

(15) **Approach Climb Performance**. For the approach climb configuration(s), the climb gradients (§ 25.121(d)) and weights up to maximum takeoff weight (§ 25.1587(b)(3)) should be presented, together with associated conditions (e.g., procedures and speeds). The affects of ice accretion on unprotected portions of the airframe, and the effects of engine and wing ice protection systems should be provided.

(16) **Landing Climb Performance**. Data for the landing climb configuration(s) should be presented in a manner similar to that described for the approach configuration above.

(17) **Landing Approach Speeds**. The scheduled speeds associated with the approved landing distances and operational landing runway lengths (see paragraph 2d(18) of this AC) should be presented, together with associated conditions.

(18) **Landing Distance**. The landing distance from a height of 50 feet must be presented either directly or with the factors required by the operating regulations, together with associated conditions and weights up to the maximum takeoff weight. For all landplanes, landing distance data must be presented for level, smooth, dry, hard-surfaced runways for standard day temperatures. At the option of the applicant, and with concurrence by the FAA, additional data may be presented for other temperatures and runway slopes within the operational limits of the airplane, or for operations on other than smooth hard-surfaced runways. For Category III operations, additional landing performance data may be required.

(19) **Performance Limits and Information Variation with Center-of-Gravity**. If performance information (e.g., buffet boundary) is not presented for the most critical c.g. condition, the AFM should present the effect of variation with c.g.

(20) **Noise Data**. The noise levels achieved during type certification in accordance with the provisions of part 36 should be presented, together with associated conditions and with the note prescribed in § 36.1581(c). The noise levels achieved during type certification should be included in the AFM and consist of only one takeoff, one sideline, and one approach noise level for each airplane model (i.e., hardware build). The noise certification stage level should accompany the noise level information to indicate the compliance status. Supplementary information (labeled as such) may be added to the AFM concerning noise levels for other configurations or conditions.

(21) **Miscellaneous Performance Data**. Any performance information or data not covered in the previous items that are required for safe operation because of unusual design features or operating or handling characteristics should be furnished. For example, the maximum quick turnaround weight should be provided.

ACJ 25.1587(b)(1):

The bank angle used in showing compliance with JAR 25.121 should be scheduled in the Flight Manual. Where it is more practical to quote the degree of lateral control (e.g. control wheel level) instead of the bank angle, this would be acceptable.

ACJ 25.1587(b)(7):

1 The landing distance from a height of 50 ft determined in accordance with JAR 25.125 should be presented together with associated conditions for weights up to the maximum take-off weight, standard temperature and corrected for not more than 50% of nominal headwind component, and not less than 150% of nominal tailwind component.

2 Data should be presented for level, smooth, dry, hard-surfaced runways. At the option of the applicant, additional data may be presented to show the effect of runway slope and temperature, within the operational limits of the aeroplane.

3 To facilitate application of operating regulations, the landing distance may be presented in the form of the operational or "factored" runway length, using the appropriate factors prescribed by the operating regulations of the state of registry of the aeroplane. The factors applied should be stated together with associated conditions.

What is the proposed action?:

Harmonize to the most stringent standard. In general, where the standards are different, the JAR standard more properly reflects current practices and is proposed as the harmonized standard. In areas, where there is a requirement in one standard that does not appear in the other standard, that

requirement has been carried over into the proposed harmonized standard. Some minor non-substantive changes are also proposed for editorial reasons.

What should the harmonized standard be?:

FAR/JAR 25.1587 :

(a) Each Airplane Flight Manual must contain information to permit conversion of the indicated temperature to free air temperature if other than a free air temperature indicator is used to comply with the requirements of §/JAR 25.1303(a)(1).

(b) Each Airplane Flight Manual must contain the performance information computed under the applicable provisions of this part/JAR-25 (including §/JAR 25.115, 25.123 and 25.125 for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable) within the operational limits of the airplane, and must contain the following:

(1) *In each case, the conditions of power, configuration, and speeds, and the procedures for handling the airplane and any system having a significant effect on the performance information.*

(2) V_S determined in accordance with §/JAR 25.103.

(3) The following performance information (determined by extrapolation and computed for the range of weights between the maximum landing weight and the maximum takeoff weight):

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

(4) *Procedures established under § 25.101 (f) and (g) that are related to the limitations and information required by §/JAR 25.1533 and by this paragraph in the form of guidance material, including any relevant limitations or information.*

(5) An explanation of significant or unusual flight or ground handling characteristics of the airplane.

(6) Corrections to indicated values of airspeed, altitude, and outside air temperature.

(7) An explanation of operational landing runway length factors included in the presentation of the landing distance, if appropriate.

How does this proposed standard address the underlying safety issue?:

It continues to address the underlying safety issue in the same manner by requiring performance information necessary for airworthiness and operational safety to be furnished in the Airplane Flight Manual

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?:

Although there are differences in wording between the proposed standard and the current FAR, these differences do not materially increase or decrease the level of safety.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?:

Maintain. The proposed standard is consistent with current practices.

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

This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?:

Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there is not expected to be a material effect from this proposed change.

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

None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?):

Existing advisory material is adequate. The advisory material will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?:

The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?:

No.

What is the cost impact of complying with the proposed standard?:

None

Does the working group want to review the draft NPRM prior to publication in the Federal Register?:

Yes

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

Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

#5

ARAC Working Group Report for FTHWG
Fast Track Harmonization Program Cat 1 Issues

Introduction

This document provides draft ARAC Working Group reports for twelve Post-SRD Category 1 (enveloping) issues for which the Flight Test Harmonization Working Group (FTHWG) has been identified as primary in the FAA Draft Rulemaking Project Record RPR #TBD, "Fast Track Harmonization Program", Revision 3, July 28, 1999.

Although the FAA had not completed formal tasking of this project as of the date of this report, the ARAC TAEIG had provided the Flight Test Harmonization Working Group (FTHWG) authorization to initiate work on this task at the June 30, 1999 TAEIG meeting. The specific rule sections for which reports are provided in this document are the following:

1. FAR/JAR 25.111(c)(4)
2. FAR/JAR 25.161(c)(2)
3. FAR/JAR 25.161(e)
4. FAR/JAR 25.175(d)
5. FAR/JAR 25.177(a) and (b)
6. FAR/JAR 25.1323(c)
7. FAR/JAR 25.1527
8. FAR/JAR 25.1583(c)
9. FAR/JAR 25.1583(f)
10. FAR/JAR 25.1585
11. FAR/JAR 25.1587
12. FAR/JAR 25X1516

Each of the above rule sections was to be enveloped, which calls for the most stringent rule and advisory material to be selected. In addition, the FTHWG was identified to support the PPIHWG in enveloping FAR/JAR 25, Appendix I. FTHWG comments relative to Appendix I are being supplied to TAEIG separately from this document.

The following reports identify the current FAA/JAA rules and advisory material for each issue, provide the proposed harmonized rule and recommendations regarding advisory material, provide the justification for the proposed changes, and provide answers to all questions contained in the ARAC Working Group Report format.

These reports are being provided to the TAEIG for review and approval at the December 1999 TAEIG meeting.

Robert G. Park, FTHWG Co-chair, U.S.

Franck Iannarelli, FTHWG Co-chair, Europe

November 12, 1999

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.111(c)(4)

What is the underlying safety issue addressed by the FAR/JAR?: This requirement sets forth the definition of the takeoff path, which is used to comply with certain airworthiness and operating limitations. Section/JAR 25.111(c)(4), which is the only paragraph that is different between the FAR and JAR, allows only certain routine crew actions to be made before the airplane reaches a height of 400 feet above the takeoff surface. Simulation studies and accident investigations have shown that during periods of high workload, as with an engine failure during takeoff, the crew might not take actions such as advancing the power levers on the operating engine(s), even if the crew knows that the operating engine(s) are not at their maximum power setting. Credit can be taken for retracting the landing gear, however, as this is accomplished routinely once a positive rate of climb is observed.

What are the current FAR and JAR standards?: see below

> Current FAR text: § 25.111(c)(4): Except for gear retraction and propeller feathering, the airplane configuration may not be changed, and no change in power or thrust that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.
>
> Current JAR text: JAR 25.111(c)(4): Except for gear retraction and automatic propeller feathering, the aeroplane configuration may not be changed, and no change in power or thrust that requires action by the pilot may be made, until the aeroplane is 400 feet above the takeoff surface.

What are the differences in the standards and what do these differences result in?: The standards are the same except for §/JAR 25.111(c)(4). Although both standards allow credit in §/JAR 25.111(c)(4) for propeller feathering before the airplane is 400 feet above the takeoff surface, the JAR standard explicitly limits this credit to **automatic** propeller feathering. The JAR standard does not allow credit for manual propeller feathering until the airplane is at least 400 feet above the takeoff surface.

FAA policy has been in accordance with the JAR standard. Only automatic propeller feathering has been accepted as complying with the intent of § 25.111(c)(4).

What, if any, are the differences in the means of compliance?:

The means of compliance are the same, except for the following 2 JAA ACJ's.

ACJ 25.111
The height references in JAR 25.111 should be interpreted as geometrical heights.

ACJ 25.111(b):

2 The time between lift-off and the initiation of gear retraction should be not less than 3 seconds and may need to be longer than 3 seconds if, on a particular aeroplane type, a longer delay is found to be appropriate.

There is no FAA equivalent to ACJ 25.111. The FAA equivalent to ACJ 25.111(b) No. 2 is paragraph 12e(2) of AC 25-7A:

(2) Procedures. The time between liftoff and initiation of gear retraction should not be less than that necessary to establish an indicated positive rate of climb plus one second.

What is the proposed action?: Codify current FAA policy by harmonizing to the JAR standard.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.111(c)(4): Except for gear retraction and automatic propeller feathering, the airplane configuration may not be changed, and no change in power or thrust that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner by codifying current FAA policy to harmonize with the JAR.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintain. In AC 25-7A, it is noted that propeller feathering before the airplane reaches a height of 400 feet must be automatic in order to receive credit for its effect on the flight path.

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

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it codifies current practices and policy.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): Revise AC 25-7A as follows:

Add a new paragraph 12a(1)(iii) to read as follows:

(iii) The height references in § 25.111 should be interpreted as geometrical heights.

Revise paragraph 12e(2) to read as follows:

(2) Procedures. The time between liftoff and the initiation of gear retraction during takeoff distance demonstrations should not be less than that necessary to establish an indicated positive rate of climb plus one second. For the purposes of flight manual expansion, the average demonstrated time delay between liftoff and initiation of gear retraction may be assumed; however, this value should not be less than 3 seconds.

How does the proposed standard compare to the current ICAO standards?: The proposed standard is consistent with the ICAO standards, which are not specific in this area.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.161(c)(2)

What is the underlying safety issue addressed by the FAR/JAR?: Section/JAR 25.161 requires that transport category airplanes maintain longitudinal, lateral, and directional trim under certain conditions of flight. The capability to trim out control forces is both a pilot workload and a flight path precision issue. An out-of-trim airplane can be fatiguing to fly and it is more difficult to maintain the desired flight path.

Section/JAR 25.161(c)(2) specifies conditions under which longitudinal trim must be maintained.

What are the current FAR and JAR standards?: see below

> Current FAR text: Section 25.161(c)(2): A glide with power off at a speed not more than 1.4 V_{S1}, with the landing gear extended, the wing flaps (i) retracted and (ii) extended, the most unfavorable center of gravity position approved for landing with the maximum landing weight, and with the most unfavorable center of gravity position approved for landing regardless of weight; and
>
> Current JAR text: JAR 25.161(c)(2): Either a glide with power off at a speed not more than 1.4 V_{S1}, or an approach within the normal range of approach speeds appropriate to the weight and configuration with power settings corresponding to a 3° glidepath, whichever is the most severe, with the landing gear extended, the wing flaps (i) retracted and (ii) extended, the most unfavourable centre of gravity position approved for landing with the maximum landing weight, and with the most unfavourable centre of gravity position approved for landing regardless of weight; and

What are the differences in the standards and what do these differences result in?: In addition to the power-off glide condition specified by the FAR, the JAR requires longitudinal trim to be maintained at speeds and power settings appropriate to an approach on a 3 degree glidepath. For airplanes where this condition is more stringent than the power-off glide condition, a design difference may result. Also, additional flight testing must be performed to demonstrate compliance.

What, if any, are the differences in the means of compliance?: Except for the means of compliance associated with the differences in the standards, the means of compliance are the same.

What is the proposed action?: Harmonize to the more stringent JAR standard. The phrase, "the most unfavourable centre of gravity position approved for landing with the

maximum landing weight" has been removed. This phrase is unnecessary because compliance must also be demonstrated at the "most unfavorable center of gravity position approved for landing regardless of weight." The original CAR 4b rule referenced "the most forward" center of gravity position in each instance, so it is conceivable that the first case could have been more critical at that time.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.161(c)(2): Either a glide with power off at a speed not more than 1.4 V_{S1}, or an approach within the normal range of approach speeds appropriate to the weight and configuration with power settings corresponding to a 3° glidepath, whichever is the most severe, with the landing gear extended, the wing flaps (i) retracted and (ii) extended, and with the most unfavorable center of gravity position approved for landing regardless of weight; and

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner, but adds a requirement to ensure that transport category airplanes maintain longitudinal trim in a power-on approach condition.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: It increases the level of safety for those transport category airplanes for which the power-on approach condition is more critical for maintaining longitudinal trim than the power-off glide condition.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: It maintains the current level of safety since industry practice is to comply with both the FAR and the JAR.

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): There is no specific advisory material for either the JAR or the FAR, so there is not a harmonization issue. Developing new harmonized advisory material appears to be unnecessary and probably would not fit within the fast track schedule.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: The cost of complying is negligible for the following reasons. For applicants already conducting JAA certifications, there are no additional costs. For other applicants, additional costs of compliance are possible (less than ½ hour of flight testing and 20 hours of data analysis).

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.161(e)

What is the underlying safety issue addressed by the FAR/JAR?: Section/JAR 25.161 requires that transport category airplanes maintain longitudinal, lateral, and directional trim under certain conditions of flight. The capability to trim out control forces is an issue of both pilot workload and capability to maintain a desired flight path. An out-of-trim airplane can be fatiguing to fly and it is more difficult to maintain the desired flight path.

Section/JAR 25.161(e) specifies conditions under which longitudinal, directional, and lateral trim must be maintained.

What are the current FAR and JAR standards?: see below

Current FAR text: *Airplanes with four or more engines.* Each airplane with four or more engines must maintain trim in rectilinear flight--

(1) At the climb speed, configuration, and power required by § 25.123(a) for the purpose of establishing the rate of climb;

(2) With the most unfavorable center of gravity position; and

(3) At the weight at which the two-engine-inoperative climb is equal to at least 0.013 V_{S0}^2 at an altitude of 5,000 feet.

Current JAR text: (e) *Aeroplanes with four or more engines.* Each aeroplane with four or more engines must maintain trim in rectilinear flight--

(1) At the climb speed, configuration, and power required by JAR 25.123(a) for the purpose of establishing gradient of climb; and

(2) With the most unfavourable centre of gravity position.

(3) *Not required for JAR-25*

What are the differences in the standards and what do these differences result in?: The FAR standard specifies a single weight at which a transport category airplane with four or more engines must maintain trim in rectilinear flight. The JAR standard, which does not contain this provision, applies at all weights. Therefore, the JAR standard is more stringent. There is also a minor wording difference between the two standards relative to the purpose of §/JAR 25.123(a).

What, if any, are the differences in the means of compliance?: Except for the means of compliance associated with the differences in the standards, the means of compliance are the same.

What is the proposed action?: Harmonize to the JAR standard, but further clarify the wording in §/JAR 25.161(e)(1) referring to the purpose of §/JAR 25.123(a). The FAR wording originated in Civil Air Regulations (CAR) Part 4b. At that time, the equivalent requirement to § 25.123(a) for two-engine-inoperative climb performance specified a minimum rate of climb that an airplane must be capable of. In the current part/JAR 25 standards, §/JAR 25.123(a) requires the determination of the en route flight paths, rather than a minimum rate of climb or climb gradient. To be consistent with the current §/JAR 25.123(a), the proposed harmonized §/JAR 25.161(e)(1) should refer to en route flight paths rather than either rate of climb (as in current FAR) or gradient of climb (as in current JAR).

The weight requirement in the FAR goes back to Civil Air Regulations Part 4b, which specified climb rates proportional to the square of the stall speed. The basis for this manner of specifying climb rates was that it was assumed that the level of safety associated with an emergency landing would depend on the kinetic energy of the airplane, which in turn is proportional to the mass times the velocity squared. For equivalent safety, it was reasoned that excess power, expressed in terms of rate of climb, should be proportional to the stall speed squared. Since the climb requirements of part 25 are now expressed in terms of climb gradient rather than rates of climb, the manner in which the weight for compliance is defined in § 25.161(e)(3) is an historical artifact and out of step with the rest of part 25.

In addition, the word "also" has been added to the lead-in sentence of the proposed standard to clarify that this is an additional requirement for airplanes with four or more engines. The requirements of §/JAR 161(d) remain applicable for these airplanes.

What should the harmonized standard be?: see below:

Proposed text of harmonized standard:

FAR/JAR 25.161(e): (e) *Airplanes with four or more engines.* Each airplane with four or more engines must also maintain trim in rectilinear flight with the most unfavorable center of gravity and at the climb speed, configuration, and power required by §/JAR 25.123(a) for the purpose of establishing the en route flight paths with two engines inoperative.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner, but expands the conditions under which airplanes with four or more engines must be able to maintain longitudinal, lateral, and directional trim by making the current standard applicable at all relevant gross weight conditions.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: Because it expands the conditions under which an airplane with four or more engines must be able to maintain longitudinal, lateral, and directional trim, the propose standard increases the level of safety relative to the current FAR.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: It maintains the current level of safety since industry practice is to comply with both the FAR and the JAR.

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): There is no specific advisory material for either the JAR or the FAR, so there is not a harmonization issue. Developing new harmonized advisory material appears to be unnecessary and probably would not fit within the fast track schedule.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.175(d)

What is the underlying safety issue addressed by the FAR/JAR?: Section/JAR 25.175 contains the conditions under which static longitudinal stability must be demonstrated for transport category airplanes. Static longitudinal stability is required by part 25 for the following reasons:

- Provides additional speed change cues to the pilot through control force changes.
- Ensures that short periods of unattended operation do not result in any significant changes in attitude, airspeed, or load factor.
- Provides predictable pitch response.
- Provides acceptable level of pilot attention (workload) to attain and maintain trim speed and altitude.
- Provides gust stability.

What are the current FAR and JAR standards?: see below

Current FAR text: *Landing.* The stick force curve must have a stable slope, and the stick force may not exceed 80 pounds, at speeds between 1.1 V_{S0} and 1.8 V_{S0} with--

(1) Wing flaps in the landing position;
(2) Landing gear extended;
(3) Maximum landing weight;
(4) Power or thrust off on the engines; and
(5) The airplane trimmed at 1.4 V_{S0} with power or thrust off.

Current JAR text: *Landing.* The stick force curve must have a stable slope, and the stick force may not exceed 80 pounds, at speeds between 1.1 V_{S0} and 1.8 V_{S0} with--

(1) Wing flaps in the landing position;
(2) Landing gear extended;
(3) Maximum landing weight;
(4) The aeroplane trimmed at 1.4 V_{S0} with –
  (i) Power or thrust off, and
  (ii) Power or thrust for level flight.

What are the differences in the standards and what do these differences result in?: The JAR standard requires the stick force criteria to be met at the power or thrust for level flight in addition to the FAR condition of power or thrust off. This additional condition requires additional flight test demonstrations to show compliance and may have an

influence on the design of airplanes for which the application of power has a significant destabilizing effect.

What, if any, are the differences in the means of compliance?: Except for the additional power-on condition required by the JAR, there are no differences in the means of compliance.

What is the proposed action?: Harmonize to the more stringent JAR standard.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.175(d): *Landing.* The stick force curve must have a stable slope, and the stick force may not exceed 80 pounds, at speeds between 1.1 V_{S0} and 1.8 V_{S0} with--

(1) Wing flaps in the landing position;
(2) Landing gear extended;
(3) Maximum landing weight;
(4) The airplane trimmed at 1.4 V_{S0} with –
  (i) Power or thrust off, and
  (ii) Power or thrust for level flight.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner, but adds a requirement to ensure that transport category airplanes have adequate static longitudinal stability in a power-on approach condition.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: It increases the level of safety for those transport category airplanes for which the power-on condition is more critical in terms of static longitudinal stability than the power-off condition.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: It maintains the current level of safety since industry practice is to comply with both the FAR and the JAR.

What other options have been considered and why were they not selected?: Harmonizing to the FAR standard was considered; however, there are normally occurring situations for which level flight in the landing configuration may be relevant. These situations include stepdown fixes on nonprecision approaches and extending the flaps and landing gear to the landing configuration when the glide slope becomes active on a precision approach, but before the glide slope intercept point.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): The existing advisory material is adequate.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: The cost of complying is negligible for the following reasons. For applicants already conducting JAA certifications, there are no additional costs. For other applicants, additional costs of compliance are possible (less than ½ hour of flight testing and 20 hours of data analysis).

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.177(a) and (b)

What is the underlying safety issue addressed by the FAR/JAR?: Section/JAR 25.177 requires that the airplane naturally recover from a skid without pilot action to move the rudder and a slip without pilot action to move the ailerons. Basic static and directional stability required by part/JAR 25:

- Provides additional cues of inadvertent slips and skids through control force changes.
- Ensures that short periods of unattended operation do not result in any significant changes in yaw or bank angle.
- Provides predictable roll and yaw response.
- Provides acceptable level of pilot attention (workload) to attain and maintain a coordinated turn.
- Provides gust stability.
- Enhances crosswind landing capability.

What are the current FAR and JAR standards?: see below

Current FAR text: (a) Reserved.

(b) Reserved

Current JAR text: (a) The static directional stability (as shown by the tendency to recover from a skid with the rudder free) must be positive for any landing gear and flap position and symmetrical power condition, at speeds from 1.2 V_{S1}, up to V_{FE}, V_{LE}, or V_{FC}/M_{FC} (as appropriate).

(b) The static lateral stability (as shown by the tendency to raise the low wing in a sideslip with the aileron controls free) for any landing gear and wing-flap position and symmetric power condition, may not be negative at any airspeed (except that speeds higher than V_{FE} need not be considered for wing-flap extended configurations nor speeds higher than V_{LE} for landing gear extended configurations) in the following airspeed ranges (see ACJ 25.177(b)):

(1) From 1.2 V_{S1} for wing-flap positions not more extended that the most extended takeoff wing-flap setting,

(2) From 1.2 V_{S1} to 1.3 V_{S1}, for wing-flap positions more extended than the most extended take-off wing-flap setting, except that negative stability may be accepted provided the divergence is—

(i) Gradual;

(ii) Easily recognisable by the pilot; and

(iii) Easily controllable by the pilot.

(3) From 1.3 V_{S1} to V_{MO}/M_{MO}.

(4) From V_{MO}/M_{MO} to V_{FC}/M_{FC}, except that negative stability may be accepted provided the divergence is—

(i) Gradual;

(ii) Easily recognisable by the pilot; and

(iii) Easily controllable by the pilot.

What are the differences in the standards and what do these differences result in?: The FAR equivalent to JAR 25.177(a) and (b) were removed by Amendment 25-72. Their removal was not meant to delete a requirement for satisfactory directional and lateral stability, but because the FAA considered it unnecessary to define the directional and lateral stability parameters as separate entities for determining whether an airplane has satisfactory directional and lateral stability. Instead, the directional and lateral stability characteristics could be determined by evaluating the force and deflection of the ailerons and rudder, and the bank and yaw angles required to maintain steady heading sideslips during the demonstration of compliance with § 25.177(c). In accordance with §§ 25.177(c) and (d), compliance with basic static and directional stability characteristics must be shown from 1.2 V_{S1} to V_{FE}, V_{LE}, or V_{FC}/M_{FC} as appropriate, except that negative stability may be acceptable between V_{MO}/M_{MO} and V_{FC}/M_{FC} if the divergence is gradual, easily recognized, and easily controlled by the pilot.

The JAR differs in that it allows negative stability (provided that the divergence is gradual, easily recognized, and easily controlled by the pilot) for flap positions more extended that the most extended takeoff flap position in the speed range from 1.2 V_{S1} to 1.3 V_{S1}.

What, if any, are the differences in the means of compliance?:

ACJ 25.177(b):

1 For speeds between 1.2 V_{S1} and 1.3 V_{S1} for wing-flap positions more extended than the most extended take-off wing flap setting, the symmetric power used during demonstrations need not exceed the power required for level flight in the conditions (speed and configuration) in which the demonstration is made.

2 Demonstration of compliance with JAR 25.177(b) should be made from sideslip angles appropriate to the operation of the aeroplane. Sideslip angles corresponding to half rudder deflection would normally be considered appropriate for this purpose.

3 The requirement is concerned with the short-term response of the aeroplane, and long term effects, due to factors such as fuel movement, need not be taken into account. If the initial response of the aeroplane on releasing the aileron control is neutral this will be acceptable, even though the response gradually becomes unstable in the longer term.

The first paragraph of the ACJ appears to be an alleviation of the requirement and is inappropriate as advisory material. The second paragraph is different from the FAA AC

25-7A guidance, which calls for an initial bank angle "not less than 10 degrees or that necessary to maintain the steady, sideslip with one-half rudder deflection, whichever comes first. The JAA Flight Test Guide is being harmonized with FAA AC 25-7A, and will be published for comment at a later date.) The third paragraph is included in the FAA AC 25-7A guidance material.

What is the proposed action?: Harmonize to the more stringent FAR standard that existed prior to Amendment 25-72 (with some minor editorial clarifications retained from the JAR standard) and the current FAA AC 25-7A material (again with minor editorial clarifications).

What should the harmonized standard be?: see below:

Proposed text of harmonized standard:

FAR/JAR 25.177 : (a) The static directional stability (as shown by the tendency to recover from a skid with the rudder free) must be positive for any landing gear and flap position and symmetrical power condition, at speeds from 1.2 V_{S1}, up to V_{FE}, V_{LE}, or V_{FC}/M_{FC} (as appropriate).

(b) The static lateral stability (as shown by the tendency to raise the low wing in a sideslip with the aileron controls free) for any landing gear and wing-flap position and symmetric power condition, may not be negative at any airspeed (except that speeds higher than V_{FE} need not be considered for flaps extended configurations nor speeds higher than V_{LE} for landing gear extended configurations) in the following airspeed ranges:

(1) From 1.2 V_S to V_{MO} / M_{MO}.

(2) From V_{MO}/M_{MO} to V_{FC}/M_{FC}, unless the divergence is –

(i) Gradual;

(ii) Easily recognizable by the pilot; and

(iii) Easily controllable by the pilot.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner, but again includes explicit requirements for separate directional and lateral stability assessments.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: It maintains the same level of safety.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: It maintains the current level of safety since industry practice is to comply with both the FAR and the JAR.

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): Existing FAA advisory material is adequate. It needs updating to delete the references to the requirements that existed prior to Amendment 25-72, since these requirements would once again be in effect. The JAR ACJ will be deleted when the JAA Flight Test Guide is adopted.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: Negligible, since compliance is normally shown during the tests conducted to show compliance with § 25.177(c).

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1323(c)

What is the underlying safety issue addressed by the FAR/JAR?: The underlying safety issue is to prevent hazardously misleading airspeed information from being presented to the flightcrew. To this end, FAR/JAR 25.1323 specify the accuracy and calibration requirements and the speed ranges over which each airspeed system must be calibrated. In addition, each airspeed system must be designed and installed so as to minimize the possibility of malfunction by the entry of foreign material, by icing, or due to a collision with a bird.

What are the current FAR and JAR standards?: see below for 25.1323(c), which is the only part of 25.1323 where the standards are different:

Current FAR text: The airspeed error of the installation, excluding the airspeed indicator instrument calibration error, may not exceed three percent or five knots, whichever is greater, throughout the speed range, from--

(1) V_{MO} to 1.3 V_{S1} with flaps retracted; and

(2) 1.3 V_{S0} to V_{FE} with flaps in the landing position.

Current JAR text: (1) The airspeed error of the installation, excluding the airspeed indicator instrument calibration error, may not exceed three percent or five knots, whichever is greater, throughout the speed range, from--

(i) V_{MO} to 1.3 V_{S1} with wing-flaps retracted; and

(ii) 1.3 V_{S0} to V_{FE} with wing-flaps in the landing position.

(2) From 1.3 V_S to stall warning speed the IAS must change perceptibly with CAS and in the same sense, and at speeds below stall warning speed the IAS must not change in an incorrect sense. (See ACJ 25.1323 (c)(2).)

(3) From V_{MO} to V_{MO} + 2/3 (V_{DF} – V_{MO}) the IAS must change perceptibly with CAS and in the same sense, and at higher speeds up to V_{DF} the IAS must not change in an incorrect sense. (See ACJ 25.1323 (c)(3).)

(4) There must be no indication of airspeed which would cause undue difficulty to the pilot during the take-off between the initiation of rotation and the achievement of a steady climbing condition.

What are the differences in the standards and what do these differences result in?: The JAR standard contains requirements, not in the FAR, for speeds greater than and less than the speed range for which accuracy requirements apply. At speeds up to 2/3 (V_{DF} – V_{MO}) and less than the stall warning speed, JAR 25.1323 requires the indicated speed to change perceptibly and in the same sense as the calibrated airspeed. At speeds up to V_{DF}, the

indicated airspeed must not change in an incorrect sense. Also, between the initiation of rotation and the achievement of a steady climbing condition during takeoff, there must not be an airspeed indication that would cause the pilot undue difficulty. An example of such an indication would be a significant pause or change in the rate of change in airspeed. Such effects could be caused by transiting through ground effect.

What, if any, are the differences in the means of compliance?:

The following JAR ACJ's and FAA AC 25-7A material are relevant:

ACJ 25.1323(c)(2): From 1.3 V_S to stall warning speed the rate of change of IAS with CAS should be not less than 0.75.

ACJ 25.1323(c)(3): From $V_{MO} + 2/3\ (V_{DF} - V_{MO})$ the rate of change of IAS with CAS should be not less than 0.5.

ACJ 25.1323(d): The design and installation of the pitot system should be such that positive drainage of moisture is provided, chafing of the tubing and excessive distortion at bends is avoided, and the lag and the possibility of moisture blockage in the tubing should be kept to an acceptable minimum.

ACJ 25.1323(e):

1. Tests should be conducted to the same standard as recommended for turbine engine air intakes (see ACJ 25.1093(b)(1)) unless it can be shown that the items are so designed and located as not to be susceptible to icing conditions. Ice crystal and mixed ice and water cloud will need to be considered where the system is likely to be susceptible to such conditions.
2. However, in conducting these test due regard should be given to the presence of the aeroplane and its effect on the local concentration of the cloud.

AC 25-7A

177. AIRSPEED INDICATING SYSTEM - § 25.1323.

a. Explanation.

(1) Methods. Unless a calibrated reference system is provided, the airspeed system should be calibrated throughout as wide a range as necessary to cover the intended flight tests. The procedures of this section are for the purpose of showing compliance with § 25.1323(b) and are not intended to cover the speed range of the flight tests. If an alternate airspeed indicating system is provided, it should be calibrated. The airspeed indicating system should be calibrated in accordance with the following methods:

(i) The tests should be conducted in stabilized flight at airspeeds throughout the speed range for the airplane configurations to be tested. The airplane's airspeed system should be calibrated against a reference airspeed system or a groundspeed course.

(ii) A reference airspeed system should consist of either of the following:

(A) An airspeed impact pressure and static pressure measurement device (or devices) that are free from error due to airplane angular changes relative to the direction of the free stream or due to slipstream variation resulting from changes in airplane configuration or power. In addition, the device or devices should have a known calibration error when located in the free stream; or

(B) Any other acceptable airspeed calibration method (e.g., the altimeter method of airspeed calibration).

(iii) When establishing the airplane's true airspeed by means of the groundspeed course, flight between the two reference points should be made at constant airspeed in two successive runs in opposite directions to eliminate the effect of wind. The runs should be made only in stable wind. The time to make the runs should be obtained by means of some calibrated device. The speed runs should not be made nearer the ground surface than a wing span's length.

(iv) If an alternate system is provided, it may be calibrated against either the reference system or the airplane's system.

(v) Airspeed Lag. With the advent of electronic instruments in the cockpit, the pneumatic signals from the pitot and static sources are processed and digitized in the Air Data Computer (ADC) and then filtered and transported to the cockpit display. As a result of the data processing and filtering, the associated time lag, and, consequently, airspeed lag at the cockpit display, can be an important consideration in the airspeed indicating system calibration during ground acceleration. As stated in § 25.1323(b), the calibration for an accelerated takeoff ground run must determine the "system error," which is the relation between indicated and calibrated airspeeds. The system error is the sum of the pneumatic lag in the pressure lines, airspeed lag due to time lags in processing the data, and static source, position error.

(A) Airspeed lag must be measured during ground acceleration tests or determined by analysis. Increments should be developed for a range of airplane gross weights considering airspeed lag at V_1 and the associated increase in accelerate-stop and takeoff distances due to lag. The error due to lag in the airspeed indicating system during ground acceleration should not be greater than 3.0 knots throughout the takeoff operating envelope of the airplane. Furthermore, an increase in the takeoff distance or the accelerate-stop distance as a result of airspeed lag should not exceed 100 ft. The 3 knots limitation is intended to establish the maximum acceptable systematic error. Even though

the lag may be within the 3 knots limit, an airspeed correction may be required to stay within the 100 ft. of increased distance.

(B) Corrections may be applied directly in the ADC or they may be introduced via the ground airspeed calibration provided in the Airplane Flight Manual (AFM). If corrections are applied directly in the ADC, it is possible to display calibrated airspeed in the cockpit. Furthermore, if acceleration data are input, the airspeed error can be computed and accounted for in real time, assuming the time lag is known. The alternative would be to use an airspeed lag increment derived from calibration tests that would represent a range of conditions within the takeoff envelope. After correction, an increase in distance due to lag should be less than 100 ft throughout the takeoff envelope, whether applied in the ADC or AFM. Consideration should be given to short field, lighter weight takeoffs (higher acceleration), as well as maximum weight and higher V_1 speeds, in deriving the increment.

(2) Configuration. Airspeed calibration tests should be conducted in the following configurations:

(i) Weight - between maximum takeoff and maximum landing.

(ii) C. G. position - optional.

(iii) Takeoff configuration(s) - ground roll.

(iv) Wing flaps and landing gear - all combinations of positions used to show compliance with the takeoff, climb, and landing requirements of 14 CFR part 25.

(v) Thrust - as required.

b. Procedures.

(1) Any one or any desired combination of the procedures in subparagraphs (2) through (4) of this paragraph may be used for calibrating the airspeed indicating system. The airspeed should be measured or determined simultaneously from the airplane's system and the reference system during stabilized runs for at least five speeds spaced throughout the speed range, the lowest not to exceed 1.3 V_S. The highest speed should not exceed V_{MO}/M_{MO}. The speed spread between the test speeds should be limited to 10 knots from V_S to 1.6 V_S or placard speed, and 20 knots from 1.6 V_S to V_{MO}.

(2) Speed course: The airspeed, power, and altitude should be stabilized before entering the speed course. Constant airspeed should be maintained during each run. The runs should be made in both directions on reciprocal headings for each speed over the speed course. The following data should be recorded:

(i) Time of day at beginning of run.

(ii) Time to make run.

(iii) Pressure altitude.

(iv) Ambient air temperature.

(v) Airspeed at several intervals during run.

(vi) Wing flap position.

(vii) Landing gear position.

(viii) Course distance.

(3) Reference airspeed system: Stabilized runs at the test speeds listed in this paragraph should be made. The airspeed from the airplane's airspeed system and the reference airspeed system should be read simultaneously. The following data should be recorded:

(i) Time of day.

(ii) Airplane's indicated airspeed.

(iii) Reference indicated airspeed.

(iv) Pressure altitude.

(v) Ambient air temperature.

(vi) Wing flap position.

(vii) Landing gear position.

(4) Other acceptable airspeed calibration methods. Stabilized flight runs at the test speeds should be made, and the necessary data recorded, to establish the airplane's airspeed system error and the configuration of the airplane. Calibration methods may also include airspeed boom, static trailing cone, and radar range.

(5) The procedures presented in this paragraph pertain to the calibration of the airspeed indicating system during takeoff ground acceleration. In particular, airplanes with electronic instruments in the cockpit must account for the airspeed lag at the cockpit display associated with data processing and filtering. The airspeed indicating system should not have a lag in excess of 3 knots at the V_1 speed during any takeoff condition. Furthermore, if airspeed lag causes an increase of more than 100 ft. in takeoff or

accelerate-stop distances, a lag correction must be applied to the airspeed indicating system. Airspeed lag should be determined by one of the following methods:

(i) Conduct ground acceleration tests for a range of airplane gross weights to calibrate Indicated Airspeed (IAS) at the cockpit display against the reference Calibrated Airspeed. Determine airspeed lag from the calibration data by comparing the cockpit displayed airspeed with the reference calibration speed for a given gross weight and V_1 speed.

(ii) Determine airspeed lag by analysis using a computer program suitable for AFM development. Compute takeoffs for a range of gross weights to determine the acceleration at V_1. Calculate airspeed lag at V_1 for a corresponding acceleration and a known time lag due to data processing and filtering. The analysis should also consider other sources of airspeed lag as appropriate, such as the pneumatic lag in the pressure lines for the pitot and static sources.

(6) Having established the calibration data, one acceptable method of adjusting for airspeed lag is to apply corrections directly in the ADC data processing to result in a lag-corrected airspeed at the cockpit display. Another would be to include an airspeed lag correction in the takeoff ground speed calibration of Indicated vs. Calibrated Airspeeds in the AFM. A single airspeed lag increment can be developed as the correction for the range of gross weights and corresponding accelerations at V_1. This increment, when applied to the calibration, must result in no more than a 100 ft. increase in takeoff or accelerate-stop distances due to airspeed lag for any takeoff condition. A more accurate correction would result from presenting airspeed lag as a function of airplane acceleration based on the calibration data. If acceleration data are available in the ADC, a real time correction for lag during the takeoff can be applied in the data processing.

What is the proposed action?: Harmonize to the more stringent JAR standard, and add the "requirements" contained in the FAA advisory material.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

Replace the current FAR/JAR 25.1323(c) with the following, and renumber the remaining paragraphs accordingly:

(c) The airspeed error of the installation, excluding the airspeed indicator instrument calibration error, may not exceed three percent or five knots, whichever is greater, throughout the speed range from--

(1) V_{MO} to 1.3 V_{S1} with flaps retracted; and

(2) 1.3 V_{S0} to V_{FE} with flaps in the landing position.

(d) From 1.3 V_S to the speed at which stall warning begins, the IAS must change perceptibly with CAS and in the same sense, and at speeds below stall warning speed the IAS must not change in an incorrect sense.
(e) From V_{MO} to V_{MO} + 2/3 (V_{DF} – V_{MO}), the IAS must change perceptibly with CAS and in the same sense, and at higher speeds up to V_{DF} the IAS must not change in an incorrect sense.
(f) There must be no indication of airspeed that would cause undue difficulty to the pilot during the takeoff between the initiation of rotation and the achievement of a steady climbing condition.
(g) The effects of airspeed lag may not introduce significant takeoff indicated airspeed bias, or significant errors in takeoff or accelerate-stop distances.

How does this proposed standard address the underlying safety issue?: The proposed standard continues to address the underlying safety issue in the same manner. JAR standards have been added for the purpose of harmonization.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: The proposed standard increases the level of safety by incorporating the additional JAR requirements. The additional requirement regarding airspeed lag codifies current FAA policy.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: It maintains the current level of safety since industry practice is to comply with both the FAR and the JAR.

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. Various options regarding the split between rule and advisory material were discussed to achieve the safety objective while ensuring flexibility in the means of compliance.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: The FAA policy regarding airspeed lag has been included in the proposed rule text.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): Add the following to AC 25-7A:

An acceptable means of compliance when demonstrating a perceptible speed change between 1.3 V_S to stall warning speed is for the rate of change of IAS with CAS to be not less than 0.75.

An acceptable means of compliance when demonstrating a perceptible speed change between V_{MO} to V_{MO} + 2/3 (V_{DF}- V_{MO}) is for the rate of change of IAS with CAS to be not less than 0.50.

The JAA will revise the relevant ACJ's to be consistent with the above text and will add the AC 25-7A text regarding airspeed lag to the JAA Flight Test Guide.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: Yes, this proposal has been coordinated with and approved by the Avionics Systems Harmonization Working Group.

What is the cost impact of complying with the proposed standard?: The Avionics HWG was asked to answer this question. Their response is: "In general the [Avionics HWG] commenters agreed that there will not be any large additional cost (if any) over the present day testing."

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1527

What is the underlying safety issue addressed by the FAR/JAR?: Operation outside the environmental envelope established for the airplane may be unsafe. Therefore, the boundaries of that envelope must be established to ensure safe operations.

What are the current FAR and JAR standards?: see below

> Current FAR text: **Maximum operating altitude**. The maximum altitude up to which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.
>
> Current JAR text: The extremes of the ambient air temperature and operating altitude for which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.

What are the differences in the standards and what do these differences result in?: The FAR standard only requires the maximum altitude portion of the environmental envelope to be established. The JAR requires both the minimum and maximum altitudes and ambient temperatures to be established. FAA policy is consistent with the JAR standard (as shown in AC 25.1581-1), but must rely on the general provisions of § 25.1501(a) ("other limitations and information necessary for safe operation must be established") for its regulatory basis.

What, if any, are the differences in the means of compliance?:

Although the explicit standards are different, there are no differences in the means of compliance. The FAA relies on the general provisions of § 25.1501(a) and the following AC 25-7A advisory material to apply the same requirement. There is no current JAA advisory material; however, the JAA will be adopting AMJ 25.1581 with Change 15 to JAR-25. AMJ 25.1581 is harmonized with FAA AC 25.1581-1.

FAA AC 25.1581-1 (paragraph 2b(3)):

> (3) Operating Limitations. The extremes of the operational variables, including any appropriate descriptions for which compliance with parts 25 and 36 has been shown and for which the AFM data have been approved, should be listed with respect to the following:

(i) Operations.

(A) Maximum takeoff, landing, and zero fuel weight limits.

(B) Minimum in-flight gross weight.

(C) **Minimum and maximum pressure altitude for which operation is limited for each flight phase (takeoff, en route, and landing). Further altitude limitations caused by changes to structure, powerplant, equipment characteristics, or flight characteristics (e.g., due to failures) should be provided.**

(D) **Ambient atmospheric temperature (maximum and minimum).**

What is the proposed action?: Codify current FAA policy by harmonizing to the JAR standard.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.1527:

The extremes of the ambient air temperature and operating altitude for which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner by codifying current FAA policy to harmonize with the JAR.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintain.

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

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it codifies current practices and policy.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): Current advisory material is adequate. The advisory material will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1583(c)

What is the underlying safety issue addressed by the FAR/JAR?: Section/JAR 25.1583 is linked to §§/JAR 25.1501 through 25.1533 in that it requires the limitations established under those sections to be provided in the Airplane Flight Manual. To ensure safe operation, any limitations established for the airplane must be made known to the flightcrew. This is accomplished through instrument markings and placards, and the information provided in the Airplane Flight Manual.

What are the current FAR and JAR standards?: see below

Current FAR text: 25.1583(c): *Weight and loading distribution.* The weight and center of gravity limits required by §§ 25.25 and 25.27 must be furnished in the Airplane Flight Manual. All of the following information must be presented either in the Airplane Flight Manual or in a separate weight and balance control and loading document which is incorporated by reference in the Airplane Flight Manual:

(1) The condition of the airplane and the items included in the empty weight as defined in accordance with § 25.29.

(2) Loading instructions necessary to ensure loading of the airplane within the weight and center of gravity limits, and to maintain the loading within these limits in flight.

(3) If certification for more than one center of gravity range is requested, the appropriate limitations, with regard to weight and loading procedures, for each separate center of gravity range.

Current JAR text: 25.1583(c): *Weight and loading distribution.* The weight and centre of gravity limitations established under JAR 25.1519 must be furnished in the aeroplane Flight Manual. All the following information including weight distribution limitations established under JAR 25.1519 must be presented either in the aeroplane Flight Manual or in a separate weight and balance control and loading document which is incorporated by reference in the aeroplane Flight Manual (see ACJ 25.1583(c));

(1) The condition of the aeroplane and the items included in the empty weight as defined in accordance with JAR 25.29.

(2) Loading instructions necessary to ensure loading of the aeroplane within the weight and centre of gravity limits, and to maintain the loading within these limits in flight.

(3) If certification for more than one centre of gravity range is requested, the appropriate limitations, with regard to weight and loading procedures, for each separate centre of gravity range.

What are the differences in the standards and what do these differences result in?: There are no practical differences in application of the standards. However, the JAR standard is more correct by referring to the requirement that establishes the weight and loading distribution limits as operating limitations. Section/JAR 25.1519 contains the requirement to establish the limitations determined under §/JAR 25.23 to 25.27 as operating limitations.

JAR 25.1583(c) requires the operating limitations established under JAR 25.1519 to be provided in the Airplane Flight Manual. Instead of referencing § 25.1519, § 25.1583(c) specifically refers to the weight and center of gravity limitations determined under §§ 25.25 and 25.27. This mistakenly excludes any operating limitations established as a result of § 25.23.

What, if any, are the differences in the means of compliance?: Although the explicit standards are different, there are no differences in the means of compliance. The FAA relies on the general provisions of § 25.1501(a) and the following AC 25-1581-1 advisory material to apply the same requirement. The JAA have a current ACJ that is relevant; however, the JAA will be adopting harmonized advisory material with Change 15 to JAR-25.

FAA AC 25.1581-1 (paragraphs 2b(1) and 2e):

2(b)(1) Weight Limitations. A statement of the maximum certified takeoff and landing weights must be provided. The maximum taxi/ramp weight, maximum zero fuel weight, and any other fixed limit on weight should also be included. Any limitations on airplane loading associated with the stated weight limitations must be included in the AFM or addressed in a separate weight and balance document. Separate takeoff and landing weight limits may be listed corresponding to each applicable constraint (e.g., structural or noise requirements, customer option, etc.), if the instructions in the Limitations Section clearly state that the most restrictive of these takeoff and landing weight limitations represent the maximum certified weights.

(i) For those performance weight limits that vary with runway length, altitude, temperature, or other variables, the variation in weight limitations may be presented as graphs in the Performance Section of the AFM and included as limitations by specific reference in the Limitations Section.

(ii) Only one set of takeoff and landing gross weight limits may be established under part 36 for a specific airplane model (i.e., hardware build).

e. Loading Instructions. Section 25.1583 requires instructions necessary to ensure loading of the airplane within the established limits of weight and center-of-gravity, and to maintain the loading within such limits in flight to be presented either in the AFM or included in a separate weight and balance document referenced in the AFM Limitations

Section. If applicable, the loading instructions must refer to the flight procedures that consider the change to the airplane's center of gravity as fuel is consumed.

(1) Loading Instructions Presented in a Separate Document. If the loading instructions are presented in a separate document, the AFM Limitations Section should contain at least the following:

(i) Maximum taxi gross weight limits.

(ii) Maximum takeoff gross weight limits.

(iii) Maximum landing gross weight limits.

(iv) Maximum zero fuel weight limits.

(v) Minimum in-flight gross weight.

(vi) Center-of-gravity limits.

(vii) Information required to maintain the airplane within the above limits.

(2) Weight and Balance Data. Documentation of the weight and balance material outlined below is normally adequate for airplanes with conventional loading and fuel management techniques. For airplanes that require fuel to be redistributed (other than through normal consumption) to maintain loading within prescribed limits, the loading instructions should be expanded as necessary.

(i) Weight Limits. A list and identification of all weight limitations should be included.

(ii) Center-of-Gravity Limits. The approved center-of-gravity range, or ranges, should be presented with due accounting for airplane configuration (i.e., landing gear position, passenger loading, cargo distribution, etc.) such that loading limits can be maintained.

(iii) Dimensions, Datum, and MAC. The dimensions and relative location of airplane features associated with weighing and loading of the airplane and with weight and balance computations should be described or illustrated.

(iv) Configuration Checklist or Equipment List. The airplane should be defined or described sufficiently to identify the presence or absence of optional systems, features, or installations that are not readily apparent. In addition, all other items of fixed or removable equipment included in the empty weight should be listed.

(v) Fuel and Other Liquids. All fuel and other liquids, including passenger service liquids, that are included in the empty weight should be identified and listed, together with the information necessary to enable ready duplication of the particular condition.

(vi) Weighing Computations. Computation of the empty weight and the empty weight c.g. location should be included.

(vii) Loading Schedule. The loading schedule should be included, if appropriate.

(viii) Loading Instructions. Complete instructions relative to the loading procedure or to the use of the loading schedule should be included.

(ix) Compartment and floor load limits should be included.

JAA ACJ 25.1583(c):

1. Indication should be given in tabular or graphic form of the c.g. limits for take-off and landing and for any other practicably separable flight condition, as appropriate for the range of weights between the maximum take-off weight and the minimum landing weight presented in accordance with JAR 25.1583(c). The landing gear position appropriate to each condition should be shown, or, alternatively, data should be presented for landing-gear-extended position only and should include the moment change due to gear retraction. C.g. limits should be presented in terms of both distance-from-datum and percentage of the mean aerodynamic chord (MAC). The datum for the former should be defined and the length and location of the MAC should be stated.
2. For those weight limitations which vary with runway length, altitude, temperature and other variables the variation in weight limitation may be presented as graphs in the performance section of the Flight Manual, and included as limitations by specific reference, in the limitations section, to the appropriate graph or page.

What is the proposed action?: Codify current FAA policy by harmonizing to the JAR standard.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.1583(c):

Weight and loading distribution. The weight and center of gravity limitations established under §/JAR 25.1519 must be furnished in the Airplane Flight Manual. All of the following information, including the weight distribution limitations established under §/JAR 25.1519, must be presented either in the Airplane Flight Manual or in a separate weight and balance control and loading document that is incorporated by reference in the Airplane Flight Manual;

(1) The condition of the airplane and the items included in the empty weight as defined in accordance with §/JAR 25.29.

(2) Loading instructions necessary to ensure loading of the airplane within the weight and center of gravity limits, and to maintain the loading within these limits in flight.

(3) If certification for more than one center of gravity range is requested, the appropriate limitations, with regard to weight and loading procedures, for each separate center of gravity range.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner by codifying current FAA policy to harmonize with the JAR.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintain.

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

What other options have been considered and why were they not selected?: No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it codifies current practices and policy.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): Existing FAA advisory material is adequate. The JAA intend to delete their ACJ when the harmonized JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1583(f)

What is the underlying safety issue addressed by the FAR/JAR?: Section/JAR 25.1583 is linked to §§/JAR 25.1501 through 25.1533 in that it requires the limitations established under those sections to be provided in the Airplane Flight Manual. To ensure safe operation, any limitations established for the airplane must be made known to the flightcrew. This is accomplished through instrument markings and placards, and the information provided in the Airplane Flight Manual.

What are the current FAR and JAR standards?: see below

Current FAR text: *Altitudes.* The altitude established under § 25.1527.

Current JAR text: *Ambient air temperatures and operating altitudes.* The extremes of the ambient air temperatures and operating altitudes established under JAR 25.1527 and an explanation of the limiting factors must be furnished.

What are the differences in the standards and what do these differences result in?: Consistent with § 25.1527, the FAR standard only requires the maximum altitude portion of the environmental envelope to be provided in the Airplane Flight Manual. Consistent with JAR 25.1527, the JAR requires both the minimum and maximum altitudes and ambient temperatures to be established. FAA policy is consistent with the JAR standard (as shown in AC 25.1581-1), but must rely on the general provisions of § 25.1501(a) ("other limitations and information necessary for safe operation must be established") for its regulatory basis.

What, if any, are the differences in the means of compliance?: Although the explicit standards are different, there are no differences in the means of compliance. The FAA relies on the general provisions of § 25.1501(a) and the following AC 25.1581-1 advisory material to apply the same requirement. There is no current JAA advisory material, but AMJ 25.1581 is harmonized with FAA AC 25.1581-1 and will be published as part of Change 15 to JAR-25.

FAA AC 25.1581-1 (paragraph 2b(3)):

(3) Operating Limitations. The extremes of the operational variables, including any appropriate descriptions for which compliance with parts 25 and 36 has been shown and for which the AFM data have been approved, should be listed with respect to the following:

(i) Operations.

(A) Maximum takeoff, landing, and zero fuel weight limits.

(B) Minimum in-flight gross weight.

(C) **Minimum and maximum pressure altitude for which operation is limited for each flight phase (takeoff, en route, and landing). Further altitude limitations caused by changes to structure, powerplant, equipment characteristics, or flight characteristics (e.g., due to failures) should be provided.**

(D) **Ambient atmospheric temperature (maximum and minimum).**

What is the proposed action?: Codify current FAA policy by harmonizing to the JAR standard. The requirement for an explanation of the limiting factors would be deleted; however, as this does not represent current practice and is unnecessary for safety.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.1583(f):

Ambient air temperatures and operating altitudes. The extremes of the ambient air temperatures and operating altitudes established under §/JAR 25.1527 must be furnished.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner by codifying current FAA policy to harmonize with the JAR.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintain.

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

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it codifies current practices and policy.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): Existing FAA advisory material is adequate. The advisory material will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1585

What is the underlying safety issue addressed by the FAR/JAR?: The primary purpose of the Airplane Flight Manual is to provide an authoritative and approved source of information considered necessary for safely operating the airplane. Consistent with this purpose, operating procedures related to airworthiness and necessary for safe operation, including those procedures that may be unique to that type of airplane, must be provided in the Airplane Flight Manual.

What are the current FAR and JAR standards?: see below

Current FAR text:

§ 25.1585 Operating procedures.

(a) Information and instructions regarding the peculiarities of normal operations (including starting and warming the engines, taxiing, operation of wing flaps, landing gear, and the automatic pilot) must be furnished, together with recommended procedures for--

(1) Engine failure (including minimum speeds, trim, operation of the remaining engines, and operation of flaps);

(2) Stopping the rotation of propellers in flight;

(3) Restarting turbine engines in flight (including the effects of altitude);

(4) Fire, decompression, and similar emergencies;

(5) Ditching (including the procedures based on the requirements of §§ 25.801, 25.807(d), 25.1411, and 25.1415(a) through (e));

(6) Use of ice protection equipment;

(7) Use of fuel jettisoning equipment, including any operating precautions relevant to the use of the system;

(8) Operation in turbulence for turbine powered airplanes (including recommended turbulence penetration airspeeds, flight peculiarities, and special control instructions);

(9) Restoring a deployed thrust reverser intended for ground operation only to the forward thrust position in flight or continuing flight and landing with the thrust reverser in any position except forward thrust; and

(10) Disconnecting the battery from its charging source, if compliance is shown with Sec. 25.1353(c)(6)(ii) or (c)(6)(iii).

(b) Information identifying each operating condition in which the fuel system independence prescribed in § 25.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(c) The buffet onset envelopes, determined under § 25.251 must be furnished. The buffet onset envelopes presented may reflect the center of gravity at which the airplane is normally loaded during cruise if corrections for the effect of different center of gravity locations are furnished.

(d) Information must be furnished which indicates that when the fuel quantity indicator reads "zero" in level flight, any fuel remaining in the fuel tank cannot be used safely in flight.

(e) Information on the total quantity of usable fuel for each fuel tank must be furnished.

Current JAR text:

JAR 25.1585 Operating procedures

(a) Information and instructions regarding operating procedures must be furnished (see ACJ 25.1585(a)) in substantial accord with the categories described below –

(1) Emergency procedures which are concerned with foreseeable but unusual situations in which immediate and precise action by the crew, as detailed in the recommended procedures, may be expected to reduce the risk of catastrophe.

(2) Other procedures peculiar to the particular type or model encountered in connection with routine operations including malfunction cases and failure conditions, involving the use of special systems and/or the alternative use of regular systems not considered as emergency procedures.

(b) Information or procedures not directly related to airworthiness or not under the control of the crew, must not be included, nor must any procedure which is accepted as basic airmanship.

(c) The buffet onset envelopes, determined under JAR 25.251 must be furnished. The buffet onset envelopes presented may reflect the centre of gravity at which the aeroplane is normally loaded during cruise if corrections for the effect of different centre of gravity locations are furnished. (See ACJ 25.1585(c).)

(d) Information must be furnished which indicates that when the fuel quantity indicator reads "zero" in level flight, any fuel remaining in the fuel tank cannot be used safely in flight.

(e) Information on the total quantity of usable fuel for each fuel tank must be furnished.

What are the differences in the standards and what do these differences result in?: The JAR does not include § 25.1585(b), the requirement that information identifying each operating condition in which the fuel system independence prescribed in § 25.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section. Lack of such information may compromise the intent of the rules regarding fuel system independence.

JAR 25.1585(a) and (b) essentially update the § 25.1585(a) requirements to better reflect current policy, practices, and interpretations. These differences are not thought to cause

any material differences in technical requirements for procedural information in the Airplane Flight Manual. Any differences in this area are thought to result more from means of compliance and interpretation differences, which have recently been addressed by harmonizing the advisory material for compliance, FAA AC 25.1581-1 and JAA AMJ 25.1581.

What, if any, are the differences in the means of compliance?:

The advisory material related to the operating procedures section of the Airplane Flight Manual are reprinted below. Although there are differences between the texts of the FAA AC and the JAA ACJ's, the JAA will be adopting harmonized advisory material with Change 15 to JAR-25.

FAA AC 25.1581 (paragraph 2c):

c. Operating Procedures Section. The Operating Procedures Section of the AFM should contain, as a minimum, the essential information, peculiar to the particular airplane type or model, that is needed for safe operation under normal and other than normal conditions. Procedures not directly related to airworthiness, or not under control of the flightcrew, should not be included in the AFM. A notation similar to the following should be placed at the beginning of the Operating Procedures Section:

> The operating procedures contained in this manual have been developed and recommended by the manufacturer and approved by the FAA for use in operating this airplane. These procedures are provided as guidance and should not be construed as prohibiting the operator from developing equivalent procedures in accordance with the applicable operating rules.

(1) Procedures Categories. Information should be presented for normal and non-normal/emergency procedures and be distinctly separated. The non-normal/emergency procedures may either be placed in one section or in separate non-normal and emergency procedures sections of the AFM. In either case, procedural tasks that are considered recall or immediate action items that must be accomplished from memory should be clearly identified.

(2) Format. Procedures should be presented in either a narrative or a checklist format, depending upon the intended use of the AFM.

(i) Narrative. This format is acceptable if sources of procedures information other than the AFM are intended for flightcrew use (e.g., a Flightcrew Operating Manual (FCOM)). Procedures presented in this format should be drafted in a manner from which the needed sequence can be easily established.

(ii) Checklist. This format should be used if the AFM is intended to be used directly by the flightcrew for operating procedures.

(3) Procedures Development. Prior to initial type certification, it is essential to verify that the proposed procedures are technically valid and operationally practicable. It

is recognized that such procedures may have had only limited operational exposure at the time of certification and may need to be revised based on service experience.

(4) Procedures Content. The content and level of detail for the normal and non-normal procedures provided in the AFM should be based on the intended use of the AFM. More information and detail should be provided in AFMs that are intended to be the flightcrew's primary source of operating procedures information than for AFMs that are not intended to be used directly by the flightcrew.

(i) General. Classifying an operating procedure as normal or non-normal should reflect whether the airplane's systems are operating normally. Procedures associated with failed or inoperative systems should be considered non-normal. Procedures associated with glideslope deviation, ground proximity warning, all-engines-operating go-around, turbulent air penetration, windshear alerts, traffic advisories or resolution alerts from the traffic alerting and collision avoidance system, etc., which do not occur routinely, should be placed in the normal procedures subsection, provided the airplane's systems are operating normally.

(ii) Other Sources of Procedures Information. The flightcrew of large transport category airplanes typically use sources of operating procedures information other than the AFM. Examples of other sources of operating procedures information include manufacturer- or operator-produced operating manuals, Quick Reference Handbooks (QRH's), System Pilot's Guides, and Emergency or Abnormal Checklists. For these airplanes, items such as cockpit checklists, systems descriptions, and the associated normal procedures should not be presented in the AFM if they are provided in other documents acceptable to the FAA. Normal procedures that are necessary for safe operation should be presented in the AFM, but the remaining normal procedures should be placed in the manufacturer-produced FCOM (or other acceptable source of operating procedures information). The non-normal procedures section of the AFM for these types of airplanes should include, as a minimum, procedures dictated by the airplane's systems and failure modes, and may also include those emergency procedures listed in paragraph 2c(5) of this AC.

(A) The system description and procedures provided in the AFM should be limited to that which is uniquely related to airplane safety or airworthiness. The AFM should include a brief general description of the system and its intended use. The limitations section of the AFM should reference the operating manual in which the detailed system description and procedures can be found. This reference should include the document title, the document or part number, and the date of issue, and may allow the use of later appropriate revisions. An example wording would be: "The *Manufacturer Unit Model* System Pilot's Guide, P/N XXXX, dated XXXX (or later appropriate revision) must be immediately available to the flightcrew whenever XXXX [e.g., navigation] is predicated on the use of the system. The software version [if applicable] stated in the Pilot's Guide must match that displayed on the equipment."

(B) Information that restricts or defines the operation of a particular system (e.g., authorizing or prohibiting specific types of approaches) should be located in the limitations section of the AFM. Emergency or abnormal procedures should be located in the appropriate procedures section(s) of the AFM.

(C) Detailed system descriptions and normal procedures that represent one means, but not the only means, of operation should be located in appropriate operating manuals with a reference placed in the procedures section of the AFM. This reference should include the document title, the document or part number, and the date of issue. The reference may also allow the use of later appropriate revisions of that document. An example wording would be: "Normal operating procedures are contained in the *Manufacturer Unit Model* System Pilot's Guide, P/N XXXX, dated XXXX (or later appropriate revision)."

(iii) AFM Used Directly. For those manufacturers and operators that do not produce other sources of procedures information (generally manufacturers and operators of small transports), the AFM is the only source of this information. In this circumstance, the AFM operating procedures information must be comprehensive and include information such as cockpit checklists, systems descriptions, and associated procedures.

(5) Emergency Procedures. The emergency procedures can be included either in a dedicated section of the AFM or in the non-normal procedures section. In either case, this section should include the procedures for handling any situation that is in a category similar to the following:

(i) Engine failure with severe damage or separation.
(ii) Multiple engine failure.
(iii) Fire in flight.
(iv) Smoke control. At least the following should be clearly stated in the AFM:

After conducting the fire or smoke procedures, land at the nearest suitable airport, unless it is visually verified that the fire has been extinguished.

(v) Rapid decompression.
(vi) Emergency descent.
(vii) Uncommanded reverser deployment in flight.
(viii) Crash landing or ditching.
(ix) Emergency evacuation.

JAA ACJ 25.1585(a):

1 In furnishing information and instructions, consideration should be given to the following. The lists do not necessarily include all items to be considered for a given aeroplane. The categorisation of certain items may need to be modified because of design features or other considerations.
2 *Emergency Procedures*
a. Engine and APU fire/separation/severe damage
b. Smoke or fire in cockpit/cabin/cargo compartment
c. Rapid decompression/emergency descent
d. Landing or go-around with jammed stabiliser
e. Runaway stabiliser
f. Flight with all engines inoperative
g. Ditching

3 *Other Procedures*

a. Engine starting
b. APU operation
c. Fuel management. The effect on unusable fuel quantity due to fuel booster pump failure should be stated.
d. Reverse thrust system.
e. Navigation system
f. Rain repellent system
g. Automatic flight control systems
h. Cabin pressurisation system
i. Oxygen system
j. Hydraulic system
k. Electrical system
l. Anti-ice/de-ice system
m. Operation in turbulence
n. Equipment cooling
o. Flight controls
p. Stall warning/stall identification system
q. Braking system
r. Fuel dumping
s. Go-around with minimum fuel
t. Landing in abnormal configurations
u. Engine shut-down and relight in flight
v. Approach and landing with engine(s) inoperative
w. Go-around with engine(s) inoperative
x. Landing gear alternate operation

4 Certain items listed in 3 may also need to be considered under 2.

5 Observance of these procedures may not be mandatory and approval of such procedures is not intended to prohibit or discourage development and use of improved or equivalent procedures based on operational experience with the aeroplane.

6 The procedures to be followed by the flight crew in the event of an engine fire, severe damage or separation of the engine should be similar, and should include identification of the failed engine as the primary action as far as the powerplant is concerned.

ACJ 25.1585(c):

The buffet onset envelopes should be accompanied by information of the maximum altitude at which it is possible to achieve a positive normal acceleration increment of 0.3 g without exceeding the buffet onset boundary, at any given combination of weight, centre of gravity location and airspeed. (See also ACJ 25.251(e).)

ACJ 25.251(e):

2 *Range of Load Factor for Normal Operations*

2.1 JAR 25.251(e) requires that the envelopes of load factor, speed, altitude and weight must provide a sufficient range of speeds and load factors for normal operations.
2.2 An acceptable means of compliance with the requirement is to establish the maximum altitude at which it is possible to achieve a positive normal acceleration increment of 0.3 g without exceeding the buffet onset boundary. See also ACJ 25.1585(c).

What is the proposed action?: Harmonize to a standard using the FAR text for 25.1585(b) (the more stringent standard), and the JAR text for the rest of the section (with some editorial changes to simplify the text and make it better reflect current practices as exemplified by the AC/AMJ 25.1581 advisory material). Although the FAR text for § 25.1585(a)/JAR 25.1585(a) and (b) could be considered to be more stringent by virtue of its being more specific as to the procedures that must be furnished in the Airplane Flight Manual, it is considered outdated and not completely consistent with current practices. Some of the mandated procedures are no longer appropriate and other important procedures are not included. The proposed standard is intended to provide a better description of what types of procedures are required to be in the Airplane Flight Manual, the specifics of which will depend on the particular design. Current advisory material lists specific procedures corresponding to the general requirement that may be appropriate to include, depending on the design.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.1585:

(a) Operating procedures must be furnished for –
(1) Normal procedures peculiar to the particular type or model encountered in connection with routine operations;
(2) Non-normal procedures for malfunction cases and failure conditions involving the use of special systems or the alternative use of regular systems; and
(3) Emergency procedures for foreseeable but unusual situations in which immediate and precise action by the crew may be expected to substantially reduce the risk of catastrophe.
(b) Information or procedures not directly related to airworthiness or not under the control of the crew, must not be included, nor must any procedure that is accepted as basic airmanship.
(c) Information identifying each operating condition in which the fuel system independence prescribed in §/JAR 25.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that section.

(d) The buffet onset envelopes, determined under §/JAR 25.251 must be furnished. The buffet onset envelopes presented may reflect the center of gravity at which the airplane is normally loaded during cruise if corrections for the effect of different center of gravity locations are furnished.
(e) Information must be furnished that indicates that when the fuel quantity indicator reads "zero" in level flight, any fuel remaining in the fuel tank cannot be used safely in flight.
(f) Information on the total quantity of usable fuel for each fuel tank must be furnished.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner by requiring information and procedures necessary for airworthiness and operational safety to be furnished in the Airplane Flight Manual.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintains the same level of safety.

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

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. Harmonizing to the most stringent standard could be interpreted as harmonizing to the FAR standard (see discussion of differences above), but the JAR standard for the proposed §§/JAR 25.1585(a) and 25.1585(b) is considered to be closer to current practices and the manner in which § 25.1585(a) is actually applied.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it is consistent with current regulatory requirements, practices and policy.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): Existing FAA advisory material is adequate. The advisory material associated with §/JAR 25.1585 will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25.1587

What is the underlying safety issue addressed by the FAR/JAR?: The primary purpose of the Airplane Flight Manual is to provide an authoritative and approved source of information considered necessary for safely operating the airplane. Consistent with this purpose, performance information related to airworthiness and necessary for safe operation must be provided in the Airplane Flight Manual.

What are the current FAR and JAR standards?: see below

Current FAR text:

§ 25.1587 Performance information.

(a) Each Airplane Flight Manual must contain information to permit conversion of the indicated temperature to free air temperature if other than a free air temperature indicator is used to comply with the requirements of § 25.1303(a)(1).

(b) Each Airplane Flight Manual must contain the performance information computed under the applicable provisions of this part for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable within the operational limits of the airplane, and must contain the following:

(1) The conditions under which the performance information was obtained, including the speeds associated with the performance information.

(2) V_S determined in accordance with § 25.103.

(3) The following performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights):

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

(4) Procedures established under § 25.101(f), (g) and (h) that are related to the limitations and information required by § 25.1533 and by this paragraph. These procedures must be in the form of guidance material, including any relevant limitations or information.

(5) An explanation of significant or unusual flight or ground handling characteristics of the airplane.

Current JAR text:

JAR 25.1587 Performance information

(a) *Not required for JAR-25*
(b) Each aeroplane Flight Manual must contain the performance information computed under the applicable provisions of this JAR-25 (including JAR 25.115, 25.123 and 25.125 for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable) within the operational limits of the aeroplane, and must contain the following:

(1) The condition of power, configuration, speeds and the procedures for handling the aeroplane and any system having a significant effect on performance upon which the performance graphs are based must be stated in each case. (See ACJ 25.1587(b)(1).)

(2) *Not required for JAR-25 as this sub-paragraph is covered by the opening sentence of sub-paragraph (b).*

(3) The following gross performance information (determined by extrapolation and computed for the range of weights between the maximum landing weight and maximum takeoff weight) must be provided:

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

(4) Procedures established under § 25.101 (f) and (g) that are related to the limitations and information required by JAR 25.1533 and by this paragraph must be stated in the form of guidance material, including any relevant limitation or information.

(5) An explanation of significant or unusual flight or ground handling characteristics of the aeroplane.

(6) Corrections to indicated values of airspeed, altitude and outside air temperature.

(7) An explanation of operational landing runway length factors included in the presentation of the landing distance, if appropriate. (See ACJ 25.1587(b)(7).)

What are the differences in the standards and what do these differences result in?: The JAR does not include § 25.1587(a) or § 25.1587(b)(2). The FAR does not include JAR 25.1587(b)(6) or 25.1587(b)(7). The JAR also contains some wording differences that primarily reflect an updating of the FAR wording to better reflect current interpretations and practices. These differences are not thought to cause any material differences in technical requirements for performance information in the Airplane Flight Manual. Any differences in this area are thought to result more from means of compliance and interpretation differences, which have recently been addressed by harmonizing the advisory material for compliance, FAA AC 25.1581-1 and JAA AMJ 25.1581.

What, if any, are the differences in the means of compliance?:

The advisory material related to the operating procedures section of the Airplane Flight Manual are reprinted below. Although there are differences between the texts of the FAA

AC and the JAA ACJ's, the FAA AC represents a harmonized text. The JAA are in the process of publishing the JAA equivalent to the FAA AC as AMJ 25.1581. The ACJ's will be removed upon publication of this AMJ.

FAA AC 25.1581-1 (paragraph 2d):

d. Performance Section. This section of the AFM contains the performance limitations and other data required by parts 25 and 36, and any special conditions that may apply. Additional information may be provided to assist the operator in complying with the operating rules or for implementing unique operational needs. The performance information should cover the operating range of weights, altitudes, temperatures, airplane configurations, thrust ratings, and any other operational variables stated as operational performance limitations for the airplane. If additional performance information is presented for operation at a specific altitude, these performance data should cover a pressure altitude span of at least the specific altitude ±1,000 feet to allow an operator to adequately account for pressure altitude variations. It is recommended that such data be included as a separate section or appendix to the AFM.

(1) General. Include all descriptive information necessary to identify the configuration and conditions for which the performance data are applicable. Such information should include the type or model designations of the airplane and its engines, the approved flap settings, a brief description of airplane systems and equipment that affect performance (e.g., anti-skid, automatic spoilers, etc.), and a statement indicating whether such systems and equipment are operative or inoperative. This section should also include definitions of terms used in the Performance Section (e.g., IAS, CAS, ISA, configuration, net flight path, icing conditions, etc.), plus calibration data for airspeed (flight and ground), Mach number, altimeter, air temperature, and other pertinent information. The airspeed, altitude, and air temperature calibration data should be presented for the following ranges:

(i) Takeoff configurations:
  (A) Ground run, 0.8 V_{1MIN} to V_{2MAX}
  (B) Inflight, V_{2MIN} to V_{FE}
(ii) Approach and landing configurations:
  (A) Approach, 1.2 V_S to V_{FE}
  (B) Landing, 1.3 V_S to V_{FE}
(iii) En route configuration:
  (A) Airspeed and Altimeter: For the takeoff/takeoff path altitude range, 1.25 V_S to V_{MO}/M_{MO}.
  (B) Airspeed and Altimeter: For higher altitudes, from 1.25 V_S or the speed for 1.2g buffet onset margin, whichever is lower, to V_{MO}/M_{MO}.
  (C) Mach Number: From the lowest useful Mach number (generally in the range of 0.4 to 0.5) to M_{MO}.
  (D) Total or Static Air Temperature: For Mach numbers corresponding to the speed ranges noted in paragraphs 2d(1)(iii)(A) and (B) of this AC.

(2) Performance Procedures. The procedures, techniques, and other conditions associated with the AFM performance data should be included. Performance procedures

may be presented as a performance subsection or in connection with a particular performance graph. In the latter case, a comprehensive listing of the conditions associated with the particular performance data may serve as procedures if sufficiently complete. The AFM should also include adequate information to enable the operator to show compliance with § 25.1001 for each takeoff.

(3) Thrust or Power Setting. Thrust or power settings should be provided for at least takeoff, maximum continuous, and go-around thrust or power, along with the thrust or power setting procedures necessary to obtain the performance shown in the AFM. These data should be shown for each applicable thrust or power setting parameter. If backing the airplane by reverse thrust or power is proposed, thrust or power setting limits should be established considering contaminated runway, foreign object damage potential, environmental control system impact, airplane weight and c.g., cockpit visibility, effect of braking, etc.

(4) Minimum Control Speeds. Minimum control speed data may be located in the Performance Section with a reference in the Limitations Section as to its location.

(5) Stall Speeds. The stall speeds established in showing compliance with certification requirements should be presented, together with associated conditions. Data should be presented in terms of calibrated airspeed.

(6) Takeoff Speeds. The takeoff speeds, V_1, V_R, and V_2, must be presented in the AFM, together with the associated conditions. These speeds should be presented in units consistent with cockpit instrument indications. V_1 and V_R speeds should be based upon ground effect calibration data, while V_2 speeds should be based upon free air calibration data. The takeoff speeds associated with the minimum control speeds and the maximum energy absorption capability of the brakes should be included. At the option of the applicant, the AFM may also include the V_1 speeds associated with unbalanced field lengths. At all conditions and airplane configurations represented in the AFM (i.e., at all altitudes, temperatures, weights, winds, runway slopes, flap settings, etc.), the accuracy of the V_1 speed should either: 1) be within 1.5 knots of the V_1 speed used to calculate the takeoff and accelerate-stop distances, or 2) not cause an increase to these distances of more than the greater of 100 feet or the incremental increase resulting from a 1.5 knot variation in V_1 speed.

(7) Takeoff and Accelerate-Stop Distances. Takeoff and accelerate-stop distances, complying with §§ 25.105, 25.109 and 25.113, must be provided. At the option of the applicant, and with concurrence by the FAA, additional data may be provided for operations on other than smooth hard-surfaced runways.

(8) Climb Limited Takeoff Weight. The climb limited takeoff weight, which is the most limiting weight showing compliance with §§ 25.121(a), (b), and (c), must be provided.

(9) Miscellaneous Takeoff Weight Limits. Takeoff weight limits should be shown for any equipment or characteristic of the airplane that imposes an additional takeoff weight restriction (e.g., maximum tire speed, maximum brake energy, fuel jettison considerations, inoperative system(s), etc.).

(10) Takeoff Climb Performance. For the prescribed takeoff climb airplane configurations, the climb gradients must be presented, together with associated conditions. The scheduled climb speed(s) should be included.

(11) Takeoff Flight Path Data. Takeoff flight paths, or performance information necessary to construct such paths, together with the associated conditions (e.g., procedures and speeds), should be presented for each approved takeoff configuration. The presentation should include all flight path segments existing between the end of the takeoff distance and the end of the takeoff path, as defined in § 25.111(a). Such data must be based upon net performance, as prescribed in §§ 25.115(b) and (c).

(12) En Route Flight Path Data. The net flight path gradient data prescribed in § 25.123 must be presented, together with the associated conditions (e.g., procedures and speeds). Data must be presented for both one- and two-engines-inoperative cases, as applicable, throughout the approved operating altitude and temperature envelope.

(13) Climb Limited Landing Weight. The climb limited landing weight, which is the most limiting weight showing compliance with §§ 25.119 and 25.121(d), should be provided.

(14) Miscellaneous Landing Weight Limits. Landing weight limits for any equipment or characteristic of the airplane configuration that imposes an additional landing weight restriction should be shown.

(15) Approach Climb Performance. For the approach climb configuration(s), the climb gradients (§ 25.121(d)) and weights up to maximum takeoff weight (§ 25.1587(b)(3)) should be presented, together with associated conditions (e.g., procedures and speeds). The affects of ice accretion on unprotected portions of the airframe, and the effects of engine and wing ice protection systems should be provided.

(16) Landing Climb Performance. Data for the landing climb configuration(s) should be presented in a manner similar to that described for the approach configuration above.

(17) Landing Approach Speeds. The scheduled speeds associated with the approved landing distances and operational landing runway lengths (see paragraph 2d(18) of this AC) should be presented, together with associated conditions.

(18) Landing Distance. The landing distance from a height of 50 feet must be presented either directly or with the factors required by the operating regulations, together with associated conditions and weights up to the maximum takeoff weight. For all landplanes, landing distance data must be presented for level, smooth, dry, hard-surfaced runways for standard day temperatures. At the option of the applicant, and with concurrence by the FAA, additional data may be presented for other temperatures and runway slopes within the operational limits of the airplane, or for operations on other than smooth hard-surfaced runways. For Category III operations, additional landing performance data may be required.

(19) Performance Limits and Information Variation with Center-of-Gravity. If performance information (e.g., buffet boundary) is not presented for the most critical c.g. condition, the AFM should present the effect of variation with c.g.

(20) Noise Data. The noise levels achieved during type certification in accordance with the provisions of part 36 should be presented, together with associated conditions and with the note prescribed in § 36.1581(c). The noise levels achieved during type certification should be included in the AFM and consist of only one takeoff, one sideline, and one approach noise level for each airplane model (i.e., hardware build). The noise certification stage level should accompany the noise level information to indicate the

compliance status. Supplementary information (labeled as such) may be added to the AFM concerning noise levels for other configurations or conditions.

(21) Miscellaneous Performance Data. Any performance information or data not covered in the previous items that are required for safe operation because of unusual design features or operating or handling characteristics should be furnished. For example, the maximum quick turnaround weight should be provided.

ACJ 25.1587(b)(1):

The bank angle used in showing compliance with JAR 25.121 should be scheduled in the Flight Manual. Where it is more practical to quote the degree of lateral control (e.g. control wheel level) instead of the bank angle, this would be acceptable.

ACJ 25.1587(b)(7):

1 The landing distance from a height of 50 ft determined in accordance with JAR 25.125 should be presented together with associated conditions for weights up to the maximum take-off weight, standard temperature and corrected for not more than 50% of nominal headwind component, and not less than 150% of nominal tailwind component.
2 Data should be presented for level, smooth, dry, hard-surfaced runways. At the option of the applicant, additional data may be presented to show the effect of runway slope and temperature, within the operational limits of the aeroplane.
3 To facilitate application of operating regulations, the landing distance may be presented in the form of the operational or "factored" runway length, using the appropriate factors prescribed by the operating regulations of the state of registry of the aeroplane. The factors applied should be stated together with associated conditions.

What is the proposed action?: Harmonize to the most stringent standard. In general, where the standards are different, the JAR standard more properly reflects current practices and is proposed as the harmonized standard. In areas, where there is a requirement in one standard that does not appear in the other standard, that requirement has been carried over into the proposed harmonized standard. Some minor non-substantive changes are also proposed for editorial reasons.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.1587 :

(a) Each Airplane Flight Manual must contain information to permit conversion of the indicated temperature to free air temperature if other than a free air temperature indicator is used to comply with the requirements of §/JAR 25.1303(a)(1).

(b) Each Airplane Flight Manual must contain the performance information computed under the applicable provisions of this part/JAR-25 (including §/JAR 25.115, 25.123 and 25.125 for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable) within the operational limits of the airplane, and must contain the following:

(1) In each case, the conditions of power, configuration, and speeds, and the procedures for handling the airplane and any system having a significant effect on the performance information.

(2) V_S determined in accordance with §/JAR 25.103.

(3) The following performance information (determined by extrapolation and computed for the range of weights between the maximum landing weight and the maximum takeoff weight):

(i) Climb in the landing configuration.

(ii) Climb in the approach configuration.

(iii) Landing distance.

(4) Procedures established under § 25.101 (f) and (g) that are related to the limitations and information required by §/JAR 25.1533 and by this paragraph in the form of guidance material, including any relevant limitations or information.

(5) An explanation of significant or unusual flight or ground handling characteristics of the airplane.

(6) Corrections to indicated values of airspeed, altitude, and outside air temperature.

(7) An explanation of operational landing runway length factors included in the presentation of the landing distance, if appropriate.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner by requiring performance information necessary for airworthiness and operational safety to be furnished in the Airplane Flight Manual

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: Although there are differences in wording between the proposed standard and the current FAR, these differences do not materially increase or decrease the level of safety.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintain. The proposed standard is consistent with current practices.

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there is not expected to be a material effect from this proposed change.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): Existing advisory material is adequate. The advisory material will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: None

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

ARAC WG Report

Report from the Flight Test Harmonization Working Group

Rule Section: FAR/JAR 25X1516

What is the underlying safety issue addressed by the FAR/JAR?: There may be speeds above which it is unsafe to extend devices into the air stream, such as spoilers, speed brakes, ram air turbines, thrust reversers, and landing lights, or to open windows or doors. Limitations must be established and made available to the flightcrew to ensure safe operation.

What are the current FAR and JAR standards?: see below

Current FAR text: None.

Current JAR text:

JAR 25X1516 Other speed limitations

Any other limitation associated with speed must be established. (See also ACJ 25X1516.)

What are the differences in the standards and what do these differences result in?: The FAR does not have an explicit requirement to mandate that any other limitation associated with speed be established, while the JAR does. The FAR relies on § 25.1501(a), "Each operating limitation specified in §§25.1503 and 25.1533 **and other limitations and information necessary for safe operation must be established**," to accomplish the same goal. There are no practical differences resulting from the difference in the standards.

What, if any, are the differences in the means of compliance?:

FAA AC 25.1581-1 Airplane Flight Manual

Paragraph 2b(7)(vi)

(vi) Any other limiting speeds for extendable devices other than the landing gear should be included as applicable (e.g., spoilers, thrust reversers, landing lights, ram air turbines (RAT), windows that may be opened in flight, etc.).

ACJ 25X1516

Speed limitations for devices such as spoilers, speed brakes, high lift devices, thrust reversers, landing lights and the opening of doors and direct vision windows, should be included.

What is the proposed action?: Harmonize to the JAR standard.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.1516:

Any other limitation associated with speed must be established.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue by requiring the airspeed limitations to be established for devices that can open into the air stream in flight.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintain

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintain

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change. However, since the proposed change does not result in any practical changes in requirements, there will not be any effect.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): No additional advisory material is needed. The advisory material will be fully harmonized when JAA AMJ 25.1581-1 is published as part of Change 15 to JAR-25. The JAA will delete ACJ 25X1516.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandu

Subject: INFORMATION: Use of ARAC (Aviation Rulemaking Advisory Committee) Recommended Rulemaking not yet formally adopted by the FAA, as a basis for equivalent level of safety or exemption to Part 25.

Date: January 4, 2001

From: Manager, Transport Standards Staff,
Aircraft Certification Service, ANM-110

Reply to
Attn. of: 00-113-1034

To: SEE DISTRIBUTION LIST

Summary:

The applicants in a number of active projects (FD728JET, EMB-170, A3XX) are proposir adopt draft FAA/JAA (Federal Aviation Administration)/(Joint Aviation Authorities) harn regulations into their certification basis. This memo describes a standardized, streamlined for the use of draft FAA/JAA harmonized regulations as a basis for an equivalent level of finding or an exemption to part 25.

Background:

The FAA and JAA have agreed to harmonize FAR/JAR 25 to the greatest extent possible. proposed by the U.S. and European aviation industry, and as agreed between the Federal A Administration (FAA) and the European Joint Aviation Authorities (JAA), an accelerated to reach harmonization has been adopted. This process is based on two procedures:

a. "Enveloping" or accepting the more stringent of the regulation in Title 14 of the Code Aviation Regulations (FAR), part 25, and the Joint Airworthiness Requirements (JAR) (C 1).

b. Assigning approximately 41 already-tasked Significant Regulatory Differences (SRD) certain additional part 25 regulatory differences, to one of two additional categories (Cate completed or near complete; and Category 3, Harmonize).

In November 1999, this harmonization initiative was officially tasked and called "Fast Tra ARAC."

Procedure:

Under this procedure, the applicant may request to use ARAC recommended rulemaking t yet adopted by FAA. In general, the applicant may take one of two possible paths: reques equivalent level of safety finding justified by compensating factors that provide an equiva higher level of safety, or petition for an exemption.

The options described above are available, provided the following conditions are met:

a. It is requested by the applicant.

b. The ARAC proposal has been forwarded by the Transport Aircraft and Engine Group (TAEIG) or the Emergency Evacuations Issues Group (EEIG) to the FAA as a form recommendation (which may include dissenting opinions or positions).

c. The ARAC proposal is considered an equivalent or higher level of safety by th Equivalent Safety Finding (ESF); or, if not, it is proposed by the applicant as being in the interest and will not adversely affect safety - Exemption.

For the ESF option, the applicant would be required to provide a brief description of the b the equivalent safety finding. This procedure would be applicable provided the proposed rulemaking has been forwarded by TAEIG or EEIG to the FAA as a formal recommendati applicant's written request for an equivalent safety finding would reference the regulation the ESF is requested and reference the draft regulation that will be the basis of the request applicant needs to differentiate between either "enveloped" Category 1, and rules that are enveloped (Categories 2 and 3). The request from the applicant will then be documented i "Statement of Issue" in an issue paper.

If the rule in question is a Category 1 item, the decision regarding whether or not the ESF meets criteria 'b' and 'c', above, would be made by the FAA and documented in the back section of the issue paper. If these criteria were not satisfied by the proposed rulemaking FAA Position to the issue paper will document the reasons why an ESF cannot be granted summarize the alternatives for certification of the product. If the FAA determines that the are satisfied, the formal definition of the compensating factors for equivalency will be doc the FAA Position of the issue paper.

If the proposed rule in question is a Category 2 or 3 item, a decision must be made whethe an equivalent safety finding is appropriate. For controversial items where a strong dissent

was voiced in the working group or could be expected by segments of the public who wer represented in the working group, an exemption may be a more appropriate solution.

Again, the decision regarding whether or not the proposal meets criteria 'b' and 'c', above be made by the FAA and documented in the Background section of the issue paper.

If an exemption is the appropriate option, the applicant must provide reasons why it is in t interest and would not adversely affect safety, per the requirements in 14 CFR 11.25. The applicant's petition for an exemption would reference the regulations for which the exemp requested and reference the draft regulation that will be the basis of the request.

This procedure does not preclude the normal equivalent safety process or exemption proce between the FAA and the applicant, irrespective of any ARAC status. The presumption, a beginning of the certification process, is that the draft harmonized standard would be equi the existing standard and that the resultant design will meet an equivalent level of safety. however, after reviewing the applicant's specific interpretation and application of the draf it is determined that the level of safety is not retained, the FAA will not be in a position to equivalent level of safety. In other words, the FAA will not guarantee a blanket approval equivalent level of safety without looking carefully at each individual case.

Original signed by Franklin Tiangsing for

John McGraw

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FAA Action: 1-g Stall Speed as the Basis for Compliance with Part 25 of the Federal Aviation Regulations; FAA-2002-13982

Federal Register

Tuesday,
November 26, 2002

Part II

Department of Transportation

Federal Aviation Administration

14 CFR Parts 1, 25, and 97

1-g Stall Speed as the Basis for Compliance With Part 25 of the Federal Aviation Regulations; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 1, 25, and 97

[Docket No. 28404; Amendment Nos. 1–49, 25–108, 97–1333]

RIN 2120–AD40

1-g Stall Speed as the Basis for Compliance With Part 25 of the Federal Aviation Regulations

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This action amends the airworthiness standards for transport category airplanes to redefine the reference stall speed for transport category airplanes as a speed not less than the 1-g stall speed instead of the minimum speed obtained in a stalling maneuver. The FAA is taking this action to provide for a consistent, repeatable reference stall speed; ensure consistent and dependable maneuvering margins; provide for adjusted multiplying factors to maintain approximately the current requirements in areas where use of the minimum speed in the stalling maneuver has proven adequate; and harmonize the applicable regulations with those currently adopted in Change 15 to the European Joint Aviation Requirements-25 (JAR–25). These changes will provide a higher level of safety for those cases in which the current methods result in artificially low operating speeds.

EFFECTIVE DATE: December 26, 2002.

FOR FURTHER INFORMATION CONTACT: Don Stimson, Airplane and Flightcrew Interface Branch, ANM–111, Transport Airplane Directorate, Aircraft Certification Service, FAA, 1601 Lind Avenue SW., Renton, WA 98055–4056; telephone (425) 227–1129; facsimile (425) 227–1320, e-mail *Don.Stimson@faa.gov.*

SUPPLEMENTARY INFORMATION:

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by taking the following steps:

(1) Go to the search function of the Department of Transportation's electronic Docket Management System (DMS) web page (*http://dms.dot.gov/search*).

(2) On the search page type in the last four digits of the Docket number shown at the beginning of this notice. Click on ''search.''

(3) On the next page, which contains the Docket summary information for the Docket you selected, click on the document number for the item you wish to view.

You can also get an electronic copy using the Internet through the Office of Rulemaking's Web page at *http://www.faa.gov/avr/armhome.htm* or the **Federal Register**'s Web page at *http://www.access.gpo.gov/su_docs/aces/aces140.html.*

You can also get a copy by submitting a request to the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue SW., Washington, DC, 20591, or by calling (202) 257–9680. Make sure to identify the amendment number or docket number of this rulemaking.

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. Therefore, any small entity that has a question regarding this document may contact their local FAA official, or the person listed under **FOR FURTHER INFORMATION CONTACT**. You can find out more about SBREFA on the Internet at our site, *http://www.faa.gov/avr/arm/sbrefa.htm.* For more information on SBREFA, e-mail us at *9–AWA–SBREFA@faa.gov.*

Background

These amendments are based on notice of proposed rulemaking (NPRM) Notice No. 95–17, which was published in the **Federal Register** on January 18, 1996 (61 FR 1260). In that notice, the FAA proposed amendments to 14 CFR parts 1, 25, 36, and 97 to redefine the reference stall speed (V_{SR}) for transport category airplanes as the 1-g stall speed instead of the minimum speed obtained in the stalling maneuver. The FAA received nearly 40 comments from 12 different commenters on the proposals contained in Notice No. 95–17. As a result of these comments, this final rule differs in some aspects from the original proposals.

As explained in Notice No. 95–17, the stalling speed (V_S) is defined as the minimum speed demonstrated in the performance stall maneuver described in § 25.103 of 14 CFR part 25 (part 25). V_S has historically served as a reference speed for determining the minimum operating speeds required under part 25 for transport category airplanes. Examples of minimum operating speeds that are based on V_S include the takeoff safety speed (V_2), the final takeoff climb speed, and the landing approach speed. For example, under part 25, V_2 must be at least 1.2 times V_S, the final takeoff climb speed must be at least 1.25 times V_S, and the landing approach speed must be at least 1.3 times V_S.

The speed margin, or difference in speed, between V_S and each minimum operating speed provides a safety ''cushion'' to ensure that normal operating speeds are sufficiently higher than the speed at which the airplane stalls. Using multiplying factors applied to V_S to provide this speed margin, however, assumes that V_S provides a proper reference stall speed. Since V_S is the minimum speed obtained in the stalling maneuver, it can be less than the lowest speed at which the airplane's weight is still supported entirely by aerodynamic lift. If V_S is significantly less than this speed, applying multiplying factors to V_S to determine the minimum operating speeds may not provide as large a speed margin as intended.

A proper reference stall speed should provide a reasonably consistent approximation of the wing's maximum usable lift. Maximum usable lift occurs at the minimum speed for which the lift provided by the wing is capable of supporting the weight of the airplane. This speed is known as the 1-g stall speed because the load factor (the ratio of airplane lift to weight) at this speed is equal to 1.0 ''g'' (where ''g'' is the acceleration caused by the force of gravity) in the direction perpendicular to the flight path of the airplane. Speeds lower than the 1-g stall speed during the stalling maneuver represent a transient flight condition that, if used as a reference for the deriving minimum operating speeds, may not provide the desired speed margin to protect against inadvertently stalling the airplane.

For transport category airplanes, the minimum speed obtained in the stall maneuver of § 25.103 usually occurs near the point in the maneuver where the airplane spontaneously pitches nose-down or where the pilot initiates recovery after reaching a deterrent level of buffet, *i.e.*, a vibration of a magnitude and severity that is a strong and effective deterrent to further speed reduction. Early generation transport category airplanes, which had fairly straight wings and non-advanced airfoils, typically pitched nose-down near the 1-g stall speed. The minimum speed in the maneuver was easy to note and record, and served as an adequate approximation of the speed for maximum lift.

For the recent generation of high speed transport category airplanes with swept wings and highly advanced airfoils, however, the minimum speed

obtained in the stalling maneuver can be substantially lower than the speed for maximum lift. Furthermore, the point at which the airplane pitches nose down or exhibits a deterrent level of buffet is more difficult to distinguish and can vary with piloting technique. As a result, the minimum speed in the stalling maneuver has become an inappropriate reference for most modern high speed transport category airplanes for establishing minimum operating speeds since it may: (1) Be inconsistently determined, and (2) represent a flight condition in which the load factor perpendicular to the flight path is substantially less than 1.0 g.

In recent years, advanced technology transport category airplanes have been developed that employ novel flight control systems. These flight control systems incorporate unique protection features that are intended to prevent the airplane from stalling. They also prevent the airplane from maintaining speeds that are slower than a small percentage above the 1-g stall speed. Because of their unique design features, the traditional method of establishing V_S as the minimum speed obtained in the stalling maneuver was inappropriate for these airplanes. The FAA issued special conditions for these airplanes to define the reference stall speed as not less than the 1-g stall speed for the flight requirements contained in subpart B of part 25.

In these special conditions, the multiplying factors used to determine the minimum operating speeds were reduced in order to maintain equivalency with acceptable operating speeds used by previous transport category airplanes. Since the 1-g stall speed is generally higher than the minimum speed obtained in the stalling maneuver, retaining the current multiplying factors would have resulted in higher minimum operating speeds for airplanes using the 1-g stall speed as a basis for the reference stall speed. However, increasing the minimum operating speeds could impose costs on operators because payloads might have to be reduced to comply with the regulations at the higher operating speeds under some performance-limited conditions. Based on the service experience of the current fleet of transport category airplanes, the costs imposed would not be offset by a commensurate increase in safety.

Several airplane types with conventional flight control systems have also been certificated using the 1-g stall speed as a lower limit to the reference stall speed. Because of the potential deficiencies in using the minimum speed demonstrated in the stalling maneuver, the FAA has been encouraging applicants to use the 1-g stall speed methodology in lieu of the minimum speed obtained in the stalling maneuver. Applicants generally desire to use 1-g stall speeds because the 1-g stall speeds are less dependent on pilot technique and other subjective evaluations. Hence, 1-g stall speeds are easier to predict and provide a higher level of confidence for developing predictions of overall airplane performance. Again, reduced multiplying factors are applied to the 1-g stall speeds to obtain minimum operating speeds equivalent to the speeds that have been found acceptable in operational service. Using 1-g stall speeds ensures that the airplane's minimum operating speeds will not be unreasonably low.

Discussion of the Proposals

In Notice No. 95–17, the FAA proposed to define the reference stall speed in § 25.103 as a speed not less than the 1-g stall speed, rather than the minimum speed obtained in the stalling maneuver. This proposal was made to provide a consistent basis for use in all type design certification requirements for transport category airplanes. The FAA proposed to introduce the symbol V_{SR} to represent this speed and to indicate that it is different than the minimum speed obtained in the stalling maneuver, V_S.

In addition, the FAA proposed to reduce the multiplying factors that are used in combination with the reference stall speed to determine the minimum operating speeds by approximately 6 percent. This change would result in minimum operating speeds equivalent to those for most current transport category airplanes since the 1-g stall speed for these airplanes is approximately 6 percent higher than the minimum speed obtained in the stalling maneuver. Demonstrating a minimum stalling speed more than 6 percent slower than the 1-g stall speed, which is possible under the current standards, would provide an unacceptable basis for determining the minimum operating speeds. The proposed standards would prevent this situation from occurring. In this respect, the proposed standards would provide a higher level of safety than the existing standards.

However, the proposed reduced factors would allow lower minimum operating speeds to be established for those airplanes that have a minimum speed in the stalling maneuver approximately equal to the 1-g stall speed. One particular class of airplanes for which this applies is airplanes equipped with devices that abruptly push the nose down (*e.g.*, stick pushers) near the angle of attack for maximum lift. These devices are typically installed on airplanes with unacceptable natural stalling characteristics. The abrupt nose down push provides an artificial stall indication and acceptable stall characteristics, and prevents the airplane from reaching a potentially hazardous natural aerodynamic stall. Typically, the minimum speed obtained in this maneuver is approximately equal to the 1-g stall speed.

Traditionally, the existing multiplying factors have been applied to these airplanes. The proposal to define the reference stall speed as the 1-g stall speed would generally have no impact for these airplanes, but reducing the multiplying factors would allow lower minimum operating speeds to be established. Therefore, this proposal would allow these airplanes to be operated at speeds and angles of attack closer to the pusher activation point than has been experienced in operational service.

The FAA considered this reduction in operating speeds for pusher-equipped airplanes to be acceptable, provided the pusher reliably performs its intended function and that unwanted operation is minimized. The FAA has addressed the majority of these concerns in a revision to Advisory Circular (AC) 25–7, the ''Flight Test Guide for Certification of Transport Category Airplanes.'' This revision, AC 25–7A, dated March 31, 1998, provides criteria for the design and function of stall indication systems, including arming and disarming, indicating and warning devices, system reliability and safety, and system functional requirements. The FAA plans to address other concerns, such as system design and manufacturing tolerances, and system design features like filtering and phase advancing, in a future revision to AC 25–7A.

In addition to proposing to define the reference stall speed as a speed not less than the 1-g stall speed and to reduce the multiplying factors for establishing the minimum operating speeds, the FAA also proposed to require applicants to demonstrate adequate maneuvering capability during the takeoff climb, en route climb, and landing approach phases of flight. During a banked turn, a portion of the lift generated by the wing provides a force to help turn the airplane. To remain at the same altitude, the airplane must produce additional lift. Therefore, banking the airplane (at a constant speed and altitude) reduces the stall margin, which is the difference between the lift required for the maneuver and the maximum lift capability of the wing. As the bank

angle increases, the stall margin is reduced proportionately. This bank angle effect on the stall margin can be determined analytically, and the multiplying factors applied to V_{SR} to determine the minimum operating speeds are intended to ensure that an adequate stall margin is maintained.

In addition to the basic effect of bank angle, however, modern wing designs also typically exhibit a significant reduction in maximum lift capability with increasing Mach number. The magnitude of this Mach number effect depends on the design characteristics of the particular wing. For wing designs with a large Mach number effect, the maximum bank angle that can be achieved while retaining an acceptable stall margin can be significantly reduced. Because the effect of Mach number can be significant, and because it can also vary greatly for different wing designs, the multiplying factors applied toV_{SR} are insufficient to ensure that adequate maneuvering capability exists at the minimum operating speeds.

To address this issue, the FAA proposed to require a minimum bank angle capability in a coordinated turn without encountering stall warning or any other characteristic that might interfere with normal maneuvering. This requirement would be added to § 25.143 as a new paragraph (g). The proposed minimum bank angles were derived by adding a 15 degree allowance for wind gusts and inadvertent overshoot to a maneuvering capability the FAA considers necessary for the specific cases identified in the proposed new paragraph. These proposed maneuver margin requirements would increase the level of safety in maneuvering flight.

Consistent with the proposed maneuver margin requirements, the FAA proposed adding §§ 25.107(c)(3), 25.107(g)(2), and 25.125(a)(2)(iii) to reference § 25.143(g) in the list of constraints applicants must consider when selecting the minimum takeoff safety speed, final takeoff speed, and reference landing speeds, respectively. The normal all-engines-operating takeoff climb speed selected by the applicant would also have to provide the minimum bank angle capability specified in the proposed § 25.143(g).

Section 25.145(a) requires that there be adequate longitudinal control available to promptly pitch the airplane's nose down from at or near the stall in order to return to the original trim speed. The intent of this requirement is to ensure sufficient pitch control for a prompt recovery if the airplane is inadvertently slowed to the point of stall. The FAA proposed to change the wording of this requirement to replace ''V_S'' with ''the stall,'' ''§ 25.103(b)(1)'' with ''§ 25.103(a)(6),'' and ''at any speed'' with ''at any point.'' These changes would be consistent with the proposed change to the definition of the reference stall speed and the proposed reformatting of § 25.103.

Although compliance with § 25.145(a) must be demonstrated both with power off and with maximum continuous power, there is no intention to require flight test demonstrations of full stalls at engine powers above that specified in § 25.201(a)(2). Instead of performing a full stall at maximum continuous power, compliance will be assessed by demonstrating sufficient static longitudinal stability and nose down control margin when the deceleration is ended at least one second past stall warning during a one knot per second deceleration. The static longitudinal stability during the maneuver and the nose down control power remaining at the end of the maneuver must be sufficient to assure compliance with the requirement.

Section 25.207 requires that a warning of an impending stall must be provided in order to prevent the pilot from inadvertently stalling the airplane. The warning must occur at a speed sufficiently higher than the stall speed to allow the pilot time to take action to avoid a stall. The speed difference between the stall speed and the speed at which the stall warning occurs is known as the stall warning margin. The FAA proposed amending the size of the stall warning margin required by § 25.207(c) because of the change in definition of the reference stall speed.

Currently, the stall warning must begin at a speed exceeding V_S by seven knots, or a lesser margin if the stall warning has enough clarity, duration, distinctiveness, or other similar properties. Requiring the same seven knot warning margin to be provided relative to V_{SR} would result in an increase to the minimum operating speeds. This increase in the minimum operating speeds would be necessary to meet the maneuvering margin requirements proposed in § 25.143(g), which are defined relative to the stall warning speed. However, as discussed previously, requiring an increase to the minimum operating speeds would impose costs to airplane operators that cannot be justified by service experience.

On the other hand, if the stall warning margin were reduced to retain approximately the same stall warning speed, the warning would occur only one or two knots prior to reaching the 1-g stall speed. Although reaching the 1-g stall speed is not likely to be a catastrophic occurrence, the FAA considers such a small stall warning margin to be unacceptable. The FAA proposed requiring a stall warning margin of at least 3 knots or 3 percent, whichever is greater, relative to V_{SR}. The FAA's proposal was made on the basis that this margin represents a reasonable balance between providing the pilot with enough warning to avert an impending stall, and providing adequate maneuvering capability at the minimum operating speeds. This proposal would retain the existing level of safety.

The FAA proposed to require a larger stall warning margin for airplanes equipped with devices that abruptly push the nose down at a selected angle of attack (*e.g.*, stick pushers). Inadvertent operation of such a device, especially close to the ground, can have more serious consequences than a comparable situation in which the pilot of an airplane without the device inadvertently slows to V_{SR}. Therefore, the FAA proposed adding § 25.207(d) to require the stall warning, for airplanes equipped with one of these devices, to occur at least 5 knots or 5 percent, whichever is greater, above the speed at which the device activates. This proposal was made on the basis of retaining the existing level of safety for airplanes equipped with such devices.

The FAA proposed to add a new paragraph, § 25.207(e), to require that, in a slow-down turn with load factors up to 1.5 g and deceleration rates up to 3 knots per second, sufficient stall warning must exist to prevent stalling when recovery is initiated not less than one second after stall warning occurs. The FAA considered this proposed requirement necessary to provide adequate stall warning during a dynamic maneuver, such as a collision avoidance maneuver. In addition, this new paragraph would provide a quantitative requirement with which to assess whether ''sufficient margin to prevent inadvertent stalling * * * in turning flight'' has been provided as required by § 25.207(a). This proposal would increase the level of safety during maneuvering flight.

The FAA proposed to add a new paragraph, § 25.207(f), to require that stall warning be provided for abnormal airplane configurations likely to be used following system failures. This proposal would add a requirement currently contained in JAR–25 and is consistent with current transport category airplane designs. There would be no impact on the existing level of safety.

On modern transport category airplanes, the natural buffet or vibration

caused by the airflow separating and reattaching itself to the wing as the airplane approaches the stall speed is usually not strong enough by itself to provide an effective stall warning. Therefore, stall warning on modern transport category airplanes is usually provided through an artificial means, such as a stick shaker that shakes the pilot's control column. Production tolerances associated with these systems can result in variations in the size of the stall warning margin for different airplanes manufactured under the same approved type design.

The FAA considers the stall warning margins proposed in §§ 25.207(c) and (d) to be the minimum acceptable warning margins, and that these margins should not be reduced by production tolerances associated with a system added to the airplane to provide an artificial stall warning. The FAA intends for the proposed stall warning margins to be available at the most critical tolerance expected in production. Applicants would be expected to demonstrate compliance with the proposed stall warning margin either by flight testing with the stall warning system set to its critical tolerance setting, or by adjusting flight test data obtained at some other setting.

The tolerances associated with the stall warning system must also be considered in relation to the proposed minimum maneuvering requirements of § 25.143(g). As proposed, § 25.143(g) would require that the airplane be capable of reaching a minimum bank angle during a coordinated turn without encountering stall warning. Because the proposed requirements already provide the capability to overshoot the intended bank angle by 15 degrees, the small differences in the speed at which the stall warning system operates due to system tolerances are not as critical. Therefore, the FAA intends for the minimum bank angles in the proposed § 25.143(g) to apply at the designed nominal setting of the stall warning system. To ensure that large production tolerances do not adversely impact the airplane's maneuvering capability free of stall warning, the bank angle capability specified in the proposed § 25.143(g) should not be reduced by more than two degrees with the stall warning system operating at its most critical tolerance. Applicants would be expected to demonstrate this capability either by flight test with the system set to its critical tolerance, or by analytically adjusting flight test data obtained at some other setting.

To be consistent with the proposed revision of the definition of the reference stall speed, the FAA proposed to incorporate reduced multiplying factors throughout part 25, where appropriate, in requirements that use speeds based on a multiple of the reference stall speed. The FAA also proposed numerous minor wording and structural changes to various sections to improve editorial clarity and to harmonize with the wording and structure proposed for JAR–25. Note that the proposed change to the term ''1.3 V_{S0}'' in § 25.175(d) reflects not only the change in multiplying factor, but also corrects a typographical error. (''1.3 V_{S0}'' should have been ''1.8 V_{S0}.'')

The FAA proposed to add the nomenclature ''final takeoff speed'' and ''reference landing speed'' and the abbreviations ''V_{FTO}'' and ''V_{REF}'' to denote these speeds, respectively, to part 1 of the FAR. These terms and abbreviations, which are commonly used in the aviation industry, would be referenced throughout the proposed amendments to part 25. The reference landing speed would be defined as the speed of the airplane, in a specified landing configuration, at the point where it descends through the landing screen height in the determination of the landing distance for manual landings. The term ''landing screen height'' refers to the height of the airplane at the beginning of the defined landing distance. This height is normally 50 feet above the landing surface (see § 25.125(a)), but approvals have been granted for steep approaches that use a landing screen height of 35 feet. The final takeoff speed would be defined as the speed of the airplane that exists at the end of the takeoff path in the en route configuration with one engine inoperative.

The FAA also proposed to add the abbreviations V_{SR}, V_{SR0}, and V_{SRI} to part 1, and use them in part 25 to denote the reference stall speed corresponding to different airplane configurations. In addition, the FAA proposed adding the abbreviation V_{SW} to part 1 to refer to the speed at which the onset of stall warning occurs.

The FAA proposed to amend § C36.9(e)(1) of Appendix C to part 36 by replacing ''1.3 V_S + 10 knots'' with ''V_{REF} + 10 knots'' and by removing the words ''or the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, whichever speed is greatest.'' The words proposed for deletion would no longer be necessary because V_{REF} would denote the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane. Also, V_{REF} would refer to the speed at the landing screen height, regardless of whether that speed for a particular airplane is 1.3 V_S, 1.23 V_{SR}, or some higher speed.

In the same manner, the FAA proposed to amend § 97.3(b) by replacing ''1.3 V_{S0}'' with ''V_{REF}.'' As noted above, V_{REF} would refer to the speed at the landing screen height used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, regardless of whether that speed for a particular airplane is 1.3 V_S, 1.23 V_{SR}, or some higher speed.

These proposals were discussed extensively with the European Joint Aviation Authorities (JAA) with the intent of harmonizing the certification requirements related to stall speed for transport category airplanes. The Joint Aviation Requirements (JAR) 25 prescribes the airworthiness standards for transport category airplanes that are accepted by the aviation regulatory authorities of a number of European states. The JAA introduced an equivalent proposal to the FAA's NPRM 95–17, called Notice of Proposed Amendment (NPA) 25B–215, to amend JAR–25 accordingly. The JAA's final 1-g stall requirements, which are equivalent to those adopted by the FAA in this rulemaking, were adopted by the JAA as part of Change 15 to JAR–25, dated October 1, 2000.

Discussion of the Comments

The FAA received nearly 40 comments from 12 different commenters on the proposals contained in Notice No. 95–17. The commenters include airplane pilots, manufacturers, operators, and the associations representing them, foreign airworthiness authorities, an organization specializing in flight testing, and private citizens. In general, the proposal to redefine the reference stall speed for transport category airplanes as the 1-g stall speed instead of the minimum speed obtained in a stalling maneuver was supported, although there were comments critical of specific details, and some commenters were supportive only if the current minimum speed method would be retained as an option that would be available for the certification of small transport category airplanes.

Those commenters who recommend retaining the minimum stall speed methodology for small transport category airplanes—small airplane manufacturers and the association representing them—believe that the proposed changes introduce additional cost and complexity into applicants'

type certification programs with no increase in safety for this class of airplanes.

One manufacturer of small transport category airplanes notes that when 1-g stall speeds were determined for one of their airplanes, the resulting operating speeds were virtually the same as those determined using the current requirements. This commenter also states that variation in piloting technique remains an issue even if the stall speeds are defined as a 1-g condition, and a more expensive flight test data system is needed to determine where the 1-g stall break occurs. The commenter points out that straight (*i.e.*, non-swept) winged airplanes, for which the discussion in Notice No. 95–17 implied the current minimum speed method is adequate, will continue to be designed and produced in the future. On airplanes with swept wings, due to different stiffness characteristics between large and small airplanes, which result in different responses to aerodynamic influences, the minimum speed in the stalling maneuver is not difficult to obtain on small transport category airplanes. The commenter concludes that the current methods should be retained for airplanes weighing less than 75,000 pounds because of the costs involved in changing to the 1-g stall speed methodology for no apparent increase in safety. (100,000 pounds is suggested as an appropriate cutoff by another commenter.)

The FAA disagrees that the proposed rule changes significantly increases cost and does not increase safety. Cost data supplied by one commenter substantially overstates the incremental cost of the test instrumentation and other items needed to support a 1-g stall speed evaluation. This commenter allocates the entire cost of a new data collection system, including purchase, installation, and calibration, to the proposed rule change, stating that this new system would be needed to determine the ''g-break'' denoting the 1-g stall speed.

The only additional instrumentation the FAA considers necessary to determine the 1-g stall speed instead of the minimum speed in the stalling maneuver would be accelerometers capable of resolving the load factor normal to the flight path. At the minimum, one accelerometer aligned along the expected 1-g stall pitch angle may provide acceptable data. Determining the point at which the 1-g stall condition is reached is most readily accomplished by a continuous calculation of the load factor-corrected lift coefficient and noting the point at which this parameter is first a maximum. Experience to date with applicants voluntarily complying with the proposed requirements has not highlighted any significant difficulties in determining the 1-g stall speed using typically existing data recording equipment. These applicants have included manufacturers of both large and small transport category airplanes.

The FAA is not surprised that for one of the commenter's airplane types, the current requirements and the 1-g stall proposal yielded virtually the same minimum operating speeds. As noted in Notice No. 95–17 and repeated in the background discussion above, the proposed change to the multiplying factors that are applied to the reference stall speed to obtain the minimum operating speeds was intentionally chosen to yield equivalent operating speeds, on average, for current transport category airplanes. However, the proposed standards would prevent the reference stall speed from being more than six percent slower than the 1-g stall speed, which the current standards do not prohibit. In this respect, the proposed standards would provide a higher level of safety than the existing standards by ensuring that unreasonably low minimum operating speeds will not be obtained.

The FAA agrees that the use of a 1-g stall speed may not entirely remove the effect of pilot technique from being a factor during the flight tests to determine the reference stall speed. However, the use of a 1-g stall speed would significantly mitigate this effect. Subjective assessments of airplane behavior for identifying the stalled condition (using the criteria specified in § 25.201(d)) would no longer be used to determine the reference stall speed. (These criteria will continue to be used, however, for evaluating the airplane handling characteristics during the stalling maneuver.) Test pilot techniques that take advantage of these subjective assessments and allow unreasonably low load factors, and hence unreasonably low stall speeds, to be achieved would no longer be permitted.

In addition, it is usually much easier to measure airspeed accurately at the 1-g stall condition than at the minimum speed reached in the stalling maneuver. Based on the experience gained from the many type certification programs that have already used the 1-g stall speed methodology, the FAA has determined that this methodology provides a more consistent, repeatable reference stall speed than the existing method.

One commenter notes that the International Civil Aviation Organization's (ICAO) Airworthiness Technical Manual (Document 9051, 1987) uses the abbreviation V_{S1g} to denote the 1-g stall speed, which is the reference speed for determining the minimum operating speeds for transport category airplanes with a certified takeoff mass of over 5,700 kg. The commenter suggests that the FAA could further international standardization by adopting ICAO's V_{S1g} abbreviation to denote the reference stall speed as a part of the rulemaking to redefine the reference stall speed as a 1-g stall speed.

The FAA actively promotes international standardization and has been working closely with the regulatory authorities of Europe and Canada during this rulemaking. The FAA considered using the abbreviation V_{S1g} to denote the reference stall speed; however, the reference stall speed may not always be equal to the 1-g stall speed. It is only required to be no less than the 1-g stall speed. Other design constraints may dictate using a reference stall speed that is higher than the 1-g stall speed. Since the reference stall speed may be different than the 1-g stall speed, the abbreviation V_{SR} was proposed and has been adopted in § 1.2 to denote the reference stall speed. This abbreviation has also been adopted by the JAA of Europe and is expected to be adopted by the Canadian regulatory authority. There were no comments on the other proposed abbreviations nor on the proposed definitions for final takeoff speed and reference landing speed. Therefore, these abbreviations and definitions are adopted as proposed.

One commenter questions the reason for the new wording in § 25.103(a)(1) to describe the option of idle or zero thrust. The commenter does not see the new wording as an improvement in clarity. The current rule states that zero thrust must be used in determining the stalling speed, except that idle thrust may be used when it does not appreciably affect the stalling speed. Stated in this manner, the rule permits the use of zero thrust when idle thrust causes an increase in the stalling speed. On some turboprop airplanes, where flight idle thrust may be negative, a lower stall speed may be demonstrated using zero thrust than would occur with idle thrust.

The FAA considers such a loss of stall speed margin in a normal flight condition to be unacceptable. In Notice No. 95–17, the FAA proposed a change such that the reference stall speed must be determined with idle thrust, except in cases where that thrust level causes an appreciable decrease in the stall speed. For such cases, not more than zero thrust must be used. There were no

comments regarding the substance of the proposed change; therefore, this section is adopted as proposed.

One commenter notes that while the proposal to the reference stall speed in terms of a 1-g stall speed would reduce the amount of scatter in the flight test data used to determine the stall speed, a significant amount of scatter would remain. To further limit the amount of experimental error inherent in the data analysis process, the commenter suggests defining the reference stall speed in terms of the maximum normal force coefficient instead of the maximum lift coefficient. Using the normal force coefficient would yield slightly higher reference stall speeds, which could penalize an airplane's load carrying capability due to the resulting increase in minimum takeoff and landing speeds, but certification costs might be reduced because the data reduction process would be simplified.

The FAA agrees that defining the reference stall speed in terms of the maximum normal force coefficient instead of the maximum lift coefficient may further reduce flight test data scatter and simplify data acquisition and analysis. However, these slight benefits are outweighed by the potentially significant economic penalties associated with the resulting higher reference stall speed. Many recent airplane types have been certified using 1-g stall criteria similar to those contained in Notice No. 95–17 and this experience does not indicate any significant problems in data quality or in the acquisition and analysis process. Data scatter using the proposed 1-g stall criteria is inconsequential compared to the data uncertainty inherent in the current stall speed definition. Therefore, the commenter's suggested change is not being adopted. However, the FAA would find it acceptable if an applicant proposed using the higher reference stall speeds derived from the maximum normal coefficient in order to simplify the data acquisition and analysis process. The proposed amendment need not be changed to allow this option.

A commenter suggests that it is technically more accurate in § 25.103(c) to refer to the lift coefficient in the definition of V_{CLMAX} as the load factor-corrected lift coefficient. The commenter also considers the proposed definition of V_{CLMAX} to be ambiguous and lacking in guidance material that would provide clarification. Other commenters made various editorial and formatting suggestions to further improve the clarity of § 25.103. The FAA agrees with these suggestions and has modified the proposal accordingly. In addition, the FAA proposes to revise Advisory Circular (AC) 25–7A, ''Flight Test Guide for Certification of Transport Category Airplanes,'' to add clarifying guidance material. A notice of proposed advisory circular revisions was published in the **Federal Register** on November 21, 2002.

Detailed comments were received from one commenter regarding the effect of the proposed rules on airplanes equipped with devices that abruptly push the nose down (*e.g.*, stick pushers) to define the point of stall. As noted in Notice No. 95–17, this proposal would allow airplanes equipped with such devices that have a trigger point set close to or before $C_{L_{MAX}}$ to achieve lower minimum operating speeds than under the existing requirements, and hence, operate at speeds and angles-of-attack closer to the device activation point than has been experienced in operational service. The FAA considered this aspect of the proposal to be acceptable provided the device performs its intended function and unwanted operation is minimized.

The commenter points out that ensuring operation when desired and preventing unwanted operation are contradictory goals that result in design tradeoffs. Regardless of the design choice, however, allowing operation closer to the device activation point increases both the probability of reaching the activation point, where the device may fail to operate, and the probability of unwanted operation. Considering these aspects, the commenter contends that the proposed standards would reduce the level of safety relative to the current standards.

The commenter suggests adding the stipulation, for airplanes equipped with a device that abruptly pushes the nose down at a selected angle-of-attack, that V_{SR} must not be less than the greater of 2 knots or 2 percent above the speed at which the device activates. The commenter further suggests that this additional requirement need not apply to turbopropeller powered airplanes that demonstrate a significant reduction in stall speed in the one-engine-inoperative power-on condition. The commenter points out that this additional requirement is very similar in scope and intent to the Notice No. 95–17 proposed requirements for stall warning, where, in addition to the requirement applying to all transport category airplanes that stall warning be 3 knots or 3 percent above V_{SR}, the stall warning for airplanes equipped with devices that abruptly push the nose down at a selected angle-of-attack would be 5 knots or 5 percent above the speed at which the device operates. The commenter believes that the proposed stall warning requirements represent an acknowledgment that the class of airplanes cannot be treated the same as conventionally stalling airplanes with respect to minimum operating speeds and associated margins.

The FAA agrees with the commenter's analysis and fundamental principle that in terms of the protection from stall provided by such a device, the characteristics resulting from its operation, and its reliability and safety, there are significant differences from a conventionally stalling airplane. Also, the difference between the 1-g stall speed and the minimum speed obtained in the stalling maneuver for this class of airplanes is closer to 0 to 3 percent, rather than the 6 percent average for conventionally stalling airplanes upon which the reduction in operating speed factors was based. Permitting a reduction in the operating speeds for this class of airplanes could potentially result in a reduction in safety that is not justified by existing operational experience.

The commenter's suggested additional constraint on V_{SR} represents a reasonable means to retain approximately equivalent safety without penalizing airplanes for which the device trigger point is at an angle-of-attack well beyond $C_{L_{MAX}}$. Therefore, § 25.103(d) is revised accordingly to require, for airplanes equipped with a device that abruptly pushes the nose down at a selected angle-of-attack, that V_{SR} not be less than 2 percent or 2 knots, whichever is greater, above the speed at which the device operates. The suggested exception for turbopropeller powered airplanes that demonstrate a significant reduction in stall speed in the one-engine-inoperative power-on condition is not included, however, because the applicable minimum operating speeds already allow for a significant effect of power on stall speeds.

The effect of this provision is to increase the minimum operating speeds, relative to the Notice No. 95–17 proposals, for airplanes equipped with devices that abruptly push the nose down at a selected angle-of-attack, but only if the device activates at a speed higher than $V_{CL_{MAX}}$ (at a load factor of one) minus 2 knots or 2 percent. This requirement for a supplementary speed margin, in combination with criteria added to AC 25–7A, dated March 31, 1998, for system arming and disarming, indicating and warning devices, system reliability and safety, and system functional requirements are intended to provide an equivalent level of safety to the requirements existing prior to the adoption of this amendment. Other

considerations, such as the effect of system design and manufacturing tolerances, and system design features like filtering and phase advancing are also relevant, and should be considered when showing compliance with the applicable requirements. The FAA is currently trying to harmonize its policy in these areas with those of Transport Canada and the JAA, and intends to add guidance in these areas in a future revision to AC 25–7A.

The FAA received several comments regarding the proposed addition of specific maneuvering requirements as a new § 25.143(g). One commenter suggests that the FAA should perform a rigorous study before including a specific gust margin in airplane maneuvering requirements. The commenter points out that the same atmospheric gust would have different effects at different airspeeds, and that using the same gust margin throughout causes the proposed after takeoff maneuvering requirement at V_2 speed to be unduly restrictive. Similarly, another commenter states that the need for a 15-degree overshoot capability should first be justified by the FAA. This commenter suggests that a 5-degree overshoot, as specified as an objective for accomplishing steep turns in the ''Airplane Transport Pilot and Type Rating Practical Test Standards,'' would be more reasonable.

Several commenters claim that the proposed maneuvering requirements, particularly the one associated with the final takeoff speed (V_{FTO}), are excessive and would be difficult to meet without increasing the operating speeds. One commenter notes that for an airplane equipped with a stick pusher that activates near $C_{L_{MAX}}$, due to design tolerances for the stick pusher and stall warning systems, V_2 and V_{FTO} would most likely be set by the proposed maneuvering requirements rather than the 1.13 and 1.18 factors applied to V_{SR}, respectively. Another commenter notes that the maneuvering requirement associated with V_{FTO} relates to a one-engine-inoperative condition of short duration, after which the airplane is accelerated to the en route climb speed. This commenter suggests that a maneuvering bank angle of 30 degrees, the same as specified for the takeoff safety speed (V_2) one-engine-inoperative condition, would be more appropriate for this condition.

This commenter further states that for many existing large transport category airplanes, an early onset of natural stall warning results in a larger stall warning margin than the minimum margin required by the regulations. At V_{FTO}, these airplanes would have a maneuvering capability to stall warning of less than the proposed 40 degrees of bank, possibly as low as 27 degrees. Requiring 40 degrees of bank capability would necessitate an increase in V_{FTO}, which could affect the net takeoff flight path used for clearance of distant obstacles. Either a different departure path may be necessary in the event of an engine failure, or takeoff weight may have to be reduced. The commenter considers the existing rule to be adequate, and the potential penalties associated with the FAA's proposal to be unjustifiable.

This commenter also questions whether the proposed 40 degree bank angle requirement at V_{FTO} was based on a 25 degree bank angle limit used by many current flight guidance systems. If so, this commenter considers such reasoning to be flawed in that not all flight guidance systems use 25 degrees as their bank angle limit. In some cases, flight guidance systems are limited to a 15 degree bank angle at the final takeoff speed.

As a final comment on this section, this commenter suggests that if the FAA believes that increased bank angles are appropriate for the en route flight paths, which are of longer time duration, this need should be addressed separately from the takeoff flight path requirements. However, the commenter does not consider it necessary to do so as this commenter is unaware of any associated safety issues.

The FAA disagrees that the maneuvering requirements specified in the proposed § 25.143(g) are excessive, including the proposed 40 degree bank angle requirement at V_{FTO}. These maneuvering requirements are comparable to the maneuvering capability implied by the current regulations assuming the stall warning margin is near the regulatory minimum. Safety records and operating practices indicate that low speed maneuvering capability is a genuine concern. Some airports necessitate close-in maneuvering on a regular or contingency basis. Accidents and incidents have occurred due to windshear, icing, and high-lift device anomalies. The ability to tolerate such operational conditions can depend on the maneuvering capability at the designated minimum operating speeds.

The proposed maneuvering requirements consist of the minimum bank angle capability the FAA deems adequate for the specified regimes of flight combined with a further 15 degrees of bank angle to provide a safety margin for various operational factors. These operational factors include both potential environmental conditions (*e.g.*, turbulence, wind gusts) and an allowance for piloting imprecision (*e.g.*, inadvertent overshoots). Because this safety margin does not represent either a specific gust margin or expected piloting precision alone, the FAA does not consider it necessary to either perform a rigorous study of the effect of atmospheric gusts nor to restrict the size of the margin to a piloting test standards objective as suggested by the commenters. The allowance and magnitude of the proposed bank angle margin is also consistent with typical industry practice.

The maneuvering requirement at V_2 speed with one engine inoperative is derived from the 15 degree bank angle allowed under § 121.189(f) after takeoff plus the specified 15 degree safety margin. At the higher speed of V_{FTO}, after the airplane has transitioned to the en route configuration and is farther along in the flight path, it is reasonable to require additional maneuvering capability appropriate to that phase of flight. The FAA considers an additional 10 degrees of maneuvering capability to be a reasonable expectation for a minimum capability after transitioning to the en route configuration and accelerating to the final takeoff climb speed. This same level of maneuvering capability exists on most transport category airplanes currently in service, and the FAA has determined that there is not a compelling reason to set a lower minimum standard. The FAA considers this same maneuvering capability (25 degrees of bank plus a 15 degree safety margin) to also be appropriate for the normal all-engines-operating takeoff case as well as for the landing approach.

For those airplane types for which the proposed maneuvering requirements would lead to an increase in V_{FTO}, any resulting penalty is expected to be small. An increase in V_{FTO} would only cause a penalty (in terms of a reduced payload capability) when the takeoff weight is restricted due to an obstacle that must be cleared in the final takeoff climb segment and cannot be avoided by turning or using an alternative flight path procedure (*e.g.*, retracting the flaps at the maximum level-off height or extending the second segment to the takeoff thrust time limit). Recent FAA acceptance of proposals to increase the time limit for using takeoff thrust from five minutes to ten minutes should further reduce the potential for economic penalties resulting from an increase in V_{FTO}.

In addition to receiving comments on the minimum bank angles proposed for the new § 25.143(g), the FAA received comments on the footnotes accompanying the table of conditions to

be demonstrated. A commenter notes that because the trigger point of an artificial stall warning device may vary with thrust or power setting, the proposed wording of footnote 1 may not cover the most critical condition for determining the airplane's maneuver margin. This commenter suggests adding the phrase ''or any greater thrust or power if more critical'' to the thrust/power setting references in footnotes 1 and 3 to the table in § 25.143(g).

Although the FAA agrees with the intent of this comment, the FAA believes that the comment may stem from a misinterpretation of the proposed requirement. The condition specified in the proposed footnote 1 to § 25.143(g) represents the highest thrust or power setting for the applicable conditions of weight, altitude, and temperature. If system design features or other relevant characteristics result in any condition of weight, altitude, or temperature being more critical than another, compliance with this requirement must be demonstrated for the most critical condition of weight, altitude, and temperature. This point is addressed further in guidance material being proposed for inclusion into AC 25–7A (a notice of proposed advisory circular revisions will be published in the **Federal Register** shortly after publication of this final rule).

The commenter further suggests simplifying the text of footnote 3 by replacing the FAA proposed text with, ''The critical thrust or power for all engines operating should be that which in the event of an engine failure would result in the minimum climb gradient specified in § 25.121, or any greater thrust or power if more critical.'' Although the FAA agrees with the intent of simplifying this footnote, the wording proposed in Notice No. 95–17 is needed to address all-engines-operating climb procedures, such as those used for noise abatement, that may use a thrust or power setting less than that used during the takeoff. Therefore, the FAA does not concur with the commenter's suggestion.

Section 25.143(g) is adopted as proposed.

One commenter suggests that the Notice No. 95–17 proposal to replace ''V_S'' with ''the stall'' in § 25.145(a) is misleading and inaccurate relative to the Notice No. 95–17 supporting discussion. The commenter believes that changing ''V_S'' to ''the stall'' is unsatisfactory for two reasons: (1) ''The stall'' is a vague terminology that might generally be defined by § 25.201(d), but without defining the configuration (*i.e.*, flaps, center-of-gravity position, power, *etc.*); and (2) The Notice No. 95–17 preamble discussion states that the demonstration should only have to be conducted down to stall warning speed plus one second, which is less demanding than the proposed new § 25.145(a). Therefore, the commenter suggests adding the words ''In a deceleration'' at the beginning of § 25.145(a) and replacing the proposed reference to ''the stall'' with ''one second after stall warning.'' Guidance could then be provided in AC 25–7 to clarify that there must be sufficient longitudinal control in this maneuver to provide confidence that pushout from an actual stall could still be accomplished.

The FAA does not intend for the change in the reference stall speed to alter the basic requirement of § 25.145(a), namely that the capability exists on transport category airplanes, at the specified configurations and power settings, to pitch the nose down from any point in the stalling maneuver and regain the trim speed. The commenter's suggested change would reduce the stringency of the regulatory requirement, while depending on non-regulatory guidance material to provided assurances that equivalent capability is retained.

Because the FAA cannot rely on non-regulatory material to establish a capability required of the airplane, the FAA has not adopted the commenter's suggested change. However, to improve clarity, the words ''the stall,'' proposed in Notice No. 95–17, have been replaced by ''stall identification (as defined in § 25.201(d))'' in the adopted § 25.145(a). In addition, techniques to show compliance with this requirement without performing a stall at maximum continuous power/thrust were included in the recent issuance of AC 25–7A. Consistent with the preamble discussion of Notice No. 95–17, compliance at maximum continuous power may be assessed by demonstrating sufficient static longitudinal stability and nose down control margin when the deceleration is ended at least one second past stall warning during a one knot per second deceleration. The static longitudinal stability during the maneuver and the nose down control power remaining at the end of the maneuver must be sufficient to assure compliance with the requirement.

Two comments were received regarding the flight test demonstrations to show compliance with § 25.177. Both comments were relative to the safety aspects of conducting full rudder sideslips at low airspeeds, as required by the current rule, although both commenters also noted that this situation may be exacerbated by the lower speeds that can result from the proposed change. The proposed changes were not intended to result in overall lower speeds. Because these comments raise issues with not only speed, but also rudder deflection, they are considered beyond the scope of the Notice No. 95–17 proposals, and § 25.177 has been adopted as proposed. These comments will be retained for consideration of potential future rulemaking to address the concerns expressed by the commenters.

There were many comments on the proposed changes to the stall warning requirements of § 25.207. One commenter requests explicit criteria to address whether or not a stick shaker is required to provide stall warning, or if a visual or aural warning is sufficient. This same commenter also asked whether production tolerances affecting the stall warning margin will be addressed in AC 25–7.

The issue of what constitutes an acceptable artificial stall warning is beyond the scope of this rulemaking. However, as stated in the current § 25.207(b) (and unchanged by this rulemaking), ''a visual stall warning device that requires the attention of the crew within the cockpit is not acceptable by itself.'' The FAA is considering future rulemaking to further address the issue of what constitutes an acceptable stall warning. Regarding stall warning tolerances, the FAA has proposed the inclusion of material addressing stall warning system tolerances into a proposed revision to AC 25–7A (a notice of proposed advisory circular revisions will be published in the **Federal Register** shortly after publication of this final rule). This material is consistent with the FAA positions expressed in the preamble of Notice No. 95–17.

Several commenters took issue with the proposed three percent or three knots stall warning margin of § 25.207(c). One commenter believes that the proposal represents an unjustified increase in the severity of this requirement relative to the current rules. This commenter notes that a requirement for stall warning to begin one percent above the 1-g stall speed would be equivalent to the current requirement of a seven percent margin from the minimum speed obtained in the stalling maneuver. As a compromise, this commenter suggests a two percent or two knot stall warning margin relative to the redefined reference stall speed. Another commenter has a concern over possible difficulties in showing compliance with the proposed arbitrary numerical margin for airplanes with a gradual loss of lift

as the angle-of-attack for maximum lift is exceeded. Both of these commenters request that any increase in the severity of this requirement: (1) Be tempered such that inappropriate design changes are not imposed for small shortfalls in meeting the strict numerical criteria; and (2) be taken into account in the Aviation Rulemaking Advisory Committee (ARAC) discussions of stall warning margin when operating in icing conditions.

Another commenter has concerns that the change in stall warning margin requirements will reduce the margin that is currently required and therefore would not retain the existing level of safety. This commenter believes that the proposed margin would not represent a reasonable balance between providing the pilot with enough warning to avert an impending stall and providing adequate maneuvering capability at the minimum operating speeds. This commenter suggests retaining the current seven knot stall warning margin from the reference stall speed, even though the reference stall speed would be redefined as the 1-g stall speed, in order to retain the existing level of safety.

Another commenter considers the proposed § 25.207(c) to represent an unjustified increase in the currently required minimum stall warning margin that would inhibit use of part of the airplane flight envelope within which the airplane is controllable without risk of structural damage. The commenter remarks that in windshear avoidance maneuvers, the likelihood of escape is maximized by flying at the minimum controllable airspeed. The commenter also disagrees with the statement made in Notice No. 95–17 that a speed lower than the 1-g stall speed represents a transient flight condition. The commenter notes that in steady climbing flight, the lift force needed to sustain steady flight is less than the airplane weight, and for larger climb angles, steady flight is sustainable at speeds lower than the 1-g stall speed. This commenter suggests revising the proposed § 25.207(c) to require the stall warning to begin at the greater of: (1) A speed higher than either one knot or one percent higher than the reference stall speed; or (2) seven knots or seven percent higher than the speed at the occurrence of a stall (as defined in § 25.201(d)).

Other comments were received on the proposed § 25.207(c) relative to the engine thrust or power setting associated with the proposed three percent or three knot stall warning margin. Two commenters support removing the reference to ''engines idling and throttles closed'' so that the same stall warning margin would apply to all power and thrust settings. One commenter suggests that to be consistent with the proposed § 25.103(a)(1) it is unnecessary to refer to throttles. This commenter also questions why the proposal states that ''§ 25.103(a)(5) does not apply'' when defining the reference stall speed to be used in connection with this requirement.

In combination with adopting the 1-g stall speed as the appropriate benchmark for the low speed end of an airplane's limit flight envelope, the FAA considers a warning three knots or three percent prior to reaching this speed to be the minimum margin needed to prevent the crew from inadvertently slowing beyond this speed. A categorical statement regarding the severity of this requirement relative to the current requirement cannot be made since the effect of the change in the reference stall speed will vary with airplane type (and with the high lift device configuration on a given type). It would, however, be inappropriate to couple the existing seven percent margin requirement relative to the minimum speed reached in the stalling maneuver with the redefined reference stall speed as one commenter suggests.

The FAA does not consider the proposed stall warning margin to unduly restrict access to useable parts of the airplane flight envelope. Relative to windshear escape, the dynamic nature of windshear warrants, if anything, a larger speed margin to the stalled condition. Using current windshear escape procedures, frequent and irregular penetrations of the stall warning margin are more likely to occur. This type of trained maneuver was not envisioned when the current stall warning requirements were promulgated. Regarding the comment that for climbing flight the lift force will be less than the airplane's weight, this condition is irrelevant for establishing the reference stall speed or defining a reasonable stall warning margin. The FAA has determined that the intent of the proposal is sufficiently clear in this respect.

The FAA agrees that the stall warning margin for other than idle thrust or power settings should be addressed. The FAA did not intend to restrict consideration of the adequacy of the stall warning margin to only the idle thrust or power condition. The general requirement for a stall warning with sufficient margin to prevent inadvertently stalling prescribed by § 25.207(a) applies to all normal configurations and flight conditions. The three knot or three percent warning margin reference in the proposed § 25.207(c) would specifically quantify this requirement for the conditions under which V_{SR} is determined. At other conditions, the FAA would have expected an equivalent margin to that prescribed by § 25.207(c). However, there is an inherent difficulty in either specifying an appropriate warning margin or determining an equivalent warning margin to that specified in the proposed § 25.207(c) for conditions other than idle thrust or power, straight flight, and the center-of-gravity position defined in the proposed § 25.103(a)(5), because VSR is undefined for those other conditions.

In response to the comments, and to clarify the situation regarding the acceptable stall warning margin for conditions other than those under which VSR is defined, the FAA has revised the proposed § 25.207(c) by specifying that stall warning must begin at least five knots or five percent, whichever is greater, prior to the speed at which the airplane is considered stalled (as defined in § 25.201(d)). This is also the stall warning margin required by JAR–25 prior to the adoption of Change 15, and is considered to neither increase nor decrease the current level of safety. By referencing the speed at which the stall is identified for determining the adequacy of the stall warning margin, and not limiting this requirement to specific conditions of thrust or power, bank angle, or center-of-gravity position, the adopted rule requires that the five knot or five percent margin must be available at all thrust/power settings, bank angles, and center-of-gravity positions.

The FAA expects this stall warning margin to be demonstrated for the conditions of bank angle, power, and center-of-gravity position prescribed for the stall demonstration tests by § 25.201(a). If, however, the stall warning margin may be affected by the system design (*e.g.*, a stall warning or stall identification system that modifies the stall warning or stall identification system as a function of thrust, bank angle, angle-of-attack rate, etc.), compliance with the adopted § 25.207(c) should be demonstrated at the most critical conditions in terms of stall warning margin.

The proposed three knot or three percent (whichever is greater) stall warning margin requirement relative to V_{SR} is retained in § 25.207(d) as an additional criterion applicable to that specific flight condition. The reference to throttles has been removed, as has the statement that the proposed § 25.103(a)(5) should not apply when

defining the reference stall speed to be used in connection with this requirement. In response to the commenter's question, the reference to § 25.103(a)(5) had been proposed because the proposed definition of the reference stall speed would have required that the center-of-gravity position for determining the reference stall speed would be that which results in the highest value of the reference stall speed. Since the center-of-gravity position at which the proposed three knot or three percent stall warning requirement would apply was not specified, it presumably would apply to all center-of-gravity positions. Therefore, without the proposed statement, a literal interpretation of the proposed requirement would have required the stall warning speed at any center-of-gravity position to be three knots or three percent above the stall speed evaluated at the most adverse center-of-gravity position. This was not the intention. Any evaluation of the effect of center-of-gravity position on the stall warning margin should be based on the same center-of-gravity position for both the stall speed and the stall warning speed.

The proposed wording, along with additional explanatory material that would have been proposed for addition to AC 25–7A, was intended to clarify that for center-of-gravity positions other than that specified in the proposed § 25.103(a)(5), the same center-of-gravity position should be used for both the stall speed and the stall warning speed. However, due to the potential for confusion over the proposed wording, and because the explicit stall warning speed margin prescribed by the proposed § 25.207(c) only applies to the conditions under which VSR is determined, the proposed wording regarding center-of-gravity position has been removed. Instead, the center-of-gravity position specified in § 25.103(b)(5) (re-numbered from the proposed § 25.103(a)(5)) has been included in the list of conditions for which the specific three knot or three percent stall warning margin of the adopted § 25.207(d) applies. For other center-of-gravity positions, the acceptable stall warning margin is now addressed in the adopted § 25.207(c).

Because of the differences between naturally stalling airplanes and those that employ a device to abruptly push the nose down at a selected angle of attack to identify the stall, the FAA proposed that the stall warning margin for airplanes that employ these devices would be required to be five knots or five percent prior to the speed at which the device activates. The application of § 25.207(d), as adopted, in combination with the adopted new requirement of § 25.103(d) will ensure that there must be a 5 knot or 5 percent stall warning margin relative to VSR for these airplanes. Therefore, the proposed § 25.207(d) is removed.

The stall speed margins required by the adopted §§ 25.207(c) and (d) must be available in terms of calibrated airspeed. Normally, test demonstrations at the conditions specified in § 25.201 (Stall demonstration) will be sufficient to show compliance with these requirements. However, if the stall warning margin for a particular airplane type varies significantly with power or thrust, center-of-gravity position, bank angle, of some other characteristic, additional test conditions may be necessary.

As with other part 25 requirements, shortfalls in demonstrating compliance with the literal terms of the stall warning margin requirements would necessitate either a design change, an exemption (per § 11.25), or features that would provide equivalent safety using an alternate means of compliance (per § 21.21(b)(1)). Other rulemaking projects in which the stall warning margin is an issue (*e.g.*, discussions of flight in icing conditions by the ARAC) will be considered on their own merits.

Several commenters object to the accelerated stall warning margin requirement proposed as a new § 25.207(e). Some of the commenters claim that, in some cases, attempts to demonstrate compliance with this proposed requirement during flight testing resulted in maneuvers that the commenters consider inappropriate for a transport category airplane. These commenters provide several examples of the maneuvers they described as inappropriate. Other commenters note that the phrase ''to prevent stalling'' needs further clarification. One commenter questions the lack of a bank angle stipulation in the proposed requirement and provided an analysis indicating that bank angles of about 45 degrees have the greatest effect on aerodynamics. This commenter also claims that a prescribed load factor and deceleration rate are not simultaneously achievable at C_{LMAX}. The commenter suggests revising the proposed § 25.207(e) to specify 30 degree banked turns (for consistency with the turning flight stall characteristics demonstration required by § 25.201(a)) with accelerated rates of entry into the stall, up to the greater of 1.5g load factor and 3 knots per second speed reduction. This suggestion was made by other commenters as well.

The FAA concurs that detailed guidance material may be helpful to ensure an appropriate and consistent demonstration of compliance with the proposed accelerated stall warning requirement. This material will be presented in the proposed revisions to AC 25–7A, which will be published in the **Federal Register** shortly after publication of this final rule.

The purpose of the proposed requirement is to ensure that adequate stall warning exists to prevent an inadvertent stall under the most demanding conditions likely to occur in normal flight. The proposed conditions of 1.5g and a three knots per second entry rate (*i.e.*, airspeed deceleration rate) correspond to the steep turn maneuver prescribed in part 121, Appendices E and F for pilot initial and proficiency training, respectively, plus some margin for error (three degrees more bank and a decreasing airspeed). The elevated load factor will emphasize any adverse stall characteristics, such as wing drop or asymmetric wing flow breakdown, while also investigating Mach and potential aeroelastic effects on available lift. The proposed three knots per second deceleration rate is intended to result in a reasonable penetration beyond the onset of stall warning. A 30-degree banked turn maneuver, as proposed by several of the commenters, produces a load factor of only 1.15g, which the FAA does not consider high enough to evaluate the effect of elevated load factor on the capability to prevent an inadvertent stall.

As noted by one of the commenters, the bank angle used during the maneuver to demonstrate compliance with this proposed requirement may affect the airplane's stall characteristics. However, this aspect is considered secondary to the primary effect of an elevated load factor on the stall warning margin. For this reason, § 25.207(e) is revised from the version published in the NPRM to prescribe a load factor rather than a bank angle. An acceptable means of producing this load factor would be a 48-degree banked turn in level flight.

As adopted, § 25.207(e) requires an airspeed deceleration rate of greater than two knots per second instead of rates up to three knots per second. This change clarifies the intent of achieving a reasonable deceleration rate rather than one specific value, and will result in the intended penetration beyond the onset of stall warning. The FAA anticipates that with typical test techniques, requiring a deceleration rate of greater than two knots per second will result in deceleration rates close to

three knots per second. The power and trim conditions are now specified in the rule in order to ensure consistent application of this requirement.

To clarify the meaning of the phrase ''to prevent stalling,'' the parenthetical expression, ''(as defined in § 25.201(d)),'' has been added in the adopted § 25.207(e). Therefore, any of the acceptable indications of a stall applicable to stall demonstration testing is also considered an indication that the airplane has stalled during the accelerated stall warning demonstration. If any of these indications of a stall occur during the accelerated stall warning demonstration, compliance with § 25.207(e) will not have been demonstrated.

Two commenters offered comments relative to subpart C (Structure) of part 25. One of these commenters suggests that the interpretation of the stall speed used in subpart C be undertaken urgently as part of the Harmonization Work Program. The other commenter suggests that either subpart C should be reworked to reflect the introduction of V_{SR} or § 25.103 should introduce definitions of V_{S0} and V_{S1} in terms of V_{SR}.

These comments regarding subpart C of part 25 are beyond the scope of this rulemaking, which is confined to the definition of the stall speed used for airplane performance determination and handling characteristics. This amendment does not affect the stall speeds used in subpart C for structural analysis.

Further consideration by the FAA regarding the proposed revisions to §§ 1.1 (Definition of reference landing speed) and 97.3(b) (Definition of aircraft approach category) has resulted in minor changes in the adopted rule relative to the original proposals. The proposed definition of reference landing speed had used the term ''landing screen height'' to identify the point in the approach at which the reference landing speed is determined. Although this term is defined in the preamble discussion of the rule proposal, it is not defined or used elsewhere within the regulations. The landing distance requirements of § 25.125 specify this height as the 50 foot height, and the adopted definition of reference landing speed in § 1.1 has been changed to be consistent with this requirement.

The preamble discussion references approvals of steep approach operations that use a ''landing screen height'' of less than the 50 foot height prescribed by the § 25.125 landing distance requirements. These types of approvals are not the norm, however, and should be processed as equivalent safety findings, special conditions, or exemptions, whichever is appropriate for the specific case.

In addition to replacing ''landing screen height'' with ''50 foot height,'' the words ''for manual landings'' have been removed from the definition of ''reference landing speed'' since the applicable § 25.125 landing distance requirements make no such distinction. Approval of automatic landing systems, including consideration of associated landing speeds and distances, is addressed in FAA ACs 20–57A, 120–28D, and 120–29.

Further review of the proposed change to § 97.3(b) indicated a potential for confusion with respect to its application to aircraft certificated using V_S, the minimum speed in the stalling maneuver, rather than V_{SR}. There is some concern that the proposed replacement of 1.3 V_{S0} with V_{REF} may introduce terminology which is not well understood by all potential users of the airspace system, and that information provided in some Airplane Flight Manuals may not be consistent with the new terminology. Therefore, as adopted, § 97.3(b) will continue to reference 1.3 V_{S0} for use in those cases where V_{REF} is not specified.

One adverse comment was received on the proposed change to § C36.9(e)(1) of Appendix C to part 36. The commenter notes that the proposed change could result in increasing the speed used to show compliance with the approach noise requirements for those cases where V_{REF} is greater than 1.23 V_{SR0} (or 1.3 V_S for airplanes certificated under the existing stall speed requirements). The commenter states that this increased speed can result in higher certificated noise levels. The commenter objects to the increased stringency and believes it to be an inappropriate consequence of changing to the 1-g stall speed reference. The commenter also notes the importance of arriving at harmonized criteria with the JAA for the approach speed used for noise certifications.

The FAA disagrees with the commenter. The proposed amendment would have replaced the words ''1.3 V_S + 10 knots'' with ''V_{REF} + 10 knots'' and removed the words ''or the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, whichever speed is greatest.'' The effect of the proposal would have been to require a steady approach speed of V_{REF} + 10 knots over the approach noise measuring point during the flight test measurement of approach noise levels.

The reference to 1.3 V_S in the current § C36.9(e)(1) had been derived from the § 25.125 landing requirements, *i.e.*, 1.3 V_S was interpreted to be the speed at the 50 foot height. Further away from the runway, at the point at which the approach noise is measured (6,562 feet from the runway threshold), the airplane is likely to be at a somewhat higher speed. Higher speeds are used during the approach to provide greater stall and controllability margins, especially in the presence of winds and gusts, with the additional speed being bled off by the time the airplane is at the 50 foot height. As stated in the preamble to the amendment that added part 36 to the FAR, ''The intent of this proposal was to require an airspeed that is highly typical of normal approach airspeeds, so that a realistic approach speed is generated. The speed 1.3 V_S + 10 knots is such an airspeed and is therefore specified * * *'' The ten knot increment applied to 1.3 V_S represents the typical approach speed at the approach noise measuring point.

In a later amendment to part 36 (Amendment 36–5), the FAA recognized that, for various reasons, a speed higher than 1.3 V_S may be used in establishing the landing distance under § 25.125. Amendment 36–5 added the words ''or the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane, whichever speed is greatest'' to the ''1.3 V_S + 10 knots'' speed requirement over the approach noise measuring point.

The additional 10 knot speed increment added to 1.3 V_S was not added to ''the speed used in establishing the approved landing distance under the airworthiness regulations constituting the type certification basis of the airplane.'' The FAA has since determined, however, that the ten knot speed increment should be applied to the speed used to determine the landing distance under § 25.125, regardless of whether that speed is 1.3 V_S or some higher speed. The flightcrew does not know whether the approach speed provided in their manuals is based on 1.3 V_S or some higher speed and will use the same procedures and speed increments in either case.

The FAA's proposal would have set the speed over the approach noise measuring point at V_{REF} +10 knots. Since V_{REF} is the speed used to determine the landing distance, a consistent speed increment would be applied to the speed applicable to the 50 foot height, regardless of whether V_{REF} is determined by stall speed,

controllability requirements, or some other parameter.

Subsequent to the publication of Notice 95–17, Working Group 1 (WG1) of the International Civil Aviation Organization (ICAO) Committee on Aviation Environmental Protection (CAEP) recommended to the ICAO CAEP that the noise certification approach reference speed contained in Volume I of Annex 16 to the Convention on International Civil Aviation (the ICAO International Standard and Recommended Practice for Aircraft Noise Certification) be changed to V_{REF} + 10 knots. The WG1 was established by the CAEP to provide technical guidance regarding revisions to Annex 16, Volume 1. The United States is a member of both the ICAO CAEP and WG1. The WG1 did not view the adoption of V_{REF} + 10 knots as having a significant effect on stringency. At its 5th meeting, which was held in January 2001, the ICAO CAEP accepted the WG1 recommendation regarding adoption of V_{REF} + 10 knots. This recommendation was subsequently included in Amendment 7 of Annex 16, Volume 1, which was adopted by the ICAO Council on June 29, 2001.

As a member of the ICAO Council, CAEP and WG1, the FAA supported the conclusion to use V_{REF} + 10 knots. The commenter has provided no support for the expressed effect on stringency. The concern expressed by the commenter regarding the use of harmonized criteria between the FAA and JAA would be eliminated by FAA adoption of the Annex 16, Amendment 7 requirement, considering that Annex 16 is the basis for the JAA noise certification requirements. Accordingly, the FAA adopted the Annex 16, Amendment 7 requirement as part of Amendment 24 to part 36, which was published in the **Federal Register** on July 8, 2002 (67 FR 45193).

Other than the changes noted above, the proposed changes to part 25 are adopted as proposed in Notice No. 95–17.

Paperwork Reduction Act

In accordance with the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), there are no requirements for information collection associated with this amendment.

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 practical. The FAA has reviewed the corresponding ICAO Standards and Recommended Practices and the Joint Aviation Authorities regulations, where they exist, and has identified no differences in these amendments and the foreign regulations.

Regulatory Evaluation Summary

Economic Evaluation, Regulatory Flexibility Determination, International Trade Impact Assessment, and Unfunded Mandates Assessment

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs each Federal agency to propose or adopt a regulation only if the agency makes a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (19 U.S.C. section 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 requires agencies to consider international standards. Where appropriate, agencies are directed to use those international standards as 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. This requirement applies only to rules that include a Federal mandate on State, local or tribal governments or the private sector, likely to result in a total expenditure of $100 million or more in any one year (adjusted for inflation.)

In conducting these analyses, the FAA has determined that this final rule: (1) Has benefits that do justify its costs; (2) is not a ''significant rulemaking'' either as defined in the Executive Order or in DOT's Regulatory Policies and Procedures; (3) will not have a significant impact on a substantial number of small entities; (4) will lessen restraints on international trade; and (5) will not contain a significant intergovernmental or private sector mandate.

These analyses, available in the docket, are summarized as follows.

Economic Evaluation

The Benefits Estimate

This rule supports the existing level of safety because type certification for part 25 airplanes based on 1-g criteria is common practice, the FAA having accepted 1-g stall criteria since the mid-80s for most part 25 type certifications, in many cases through the Issue Paper process. This rule establishes the codification of this practice, and thus adds the safety benefit of preventing deviation from this practice. The FAA has not attempted to quantify this benefit.

The FAA also expects this rule will result in added benefits in the form of cost savings to those affected manufacturers that carry out type certification to both FAR and JAR requirements. Historically, U.S. manufacturers that certificate part 25 airplanes to both FAA and JAA requirements using 1-g stall speed criteria have done so by working out separate arrangements with both authorities. The FAA expects compliance with a single harmonized FAA/JAA regulatory standard will be simpler and more direct than compliance through separate arrangements, and that cost savings will result. The FAA has not attempted to quantify this benefit.

The Estimate of Costs and Its Evolution

As noted, the FAA has accepted 1-g stall speed criteria for most part 25 type certification projects since the mid-1980s. The FAA expects this rule will not change the substance of accepted certification practices. Thus, no more than minimal additional certification costs will be associated with this new rule.

However, as certification practices and aviation technology have evolved since the mid-1980s, the costs of certification at 1-g have changed. As these costs have changed, manufacturers' estimates of comparative certification costs have changed; and FAA's estimates of the costs associated with this rule have changed.

This final rule evaluation was begun in 1999. It completes the regulatory evaluation process that began with research pursuant to a 1996 NPRM. Comments to the docket in response to that NPRM were received in 1996. Pursuant to this final rule evaluation, providers of previously received information were asked to review, clarify and update their information as necessary. Their clarifications and updates, together with the previous research and analysis are the basis for the conclusions developed in this final rule evaluation.

While the costs provided in the 1996 comments were much higher than those of the 1996 NPRM, the 1999 clarifications and updates brought the costs developed in this final rule evaluation more into line with those of the NPRM. Cost estimates for typical

type certification projects that use 1-g stall speed as the reference datum have evolved as follow:

• In 1996, the NPRM concluded that the costs of 1-g compliance differed depending upon the size of the airplane certified. In then-current dollars, the NPRM estimated compliance costs of $195,000 for a type certification for large part 25 airplanes. For small part 25 airplanes, the NPRM estimate included a one-time cost of $70,000 for each manufacturer and subsequent type certification costs of $250,000. This final rule evaluation concludes that neither regulatory nor practical distinctions between small and large airplanes allow the unambiguous grouping by size category needed to support the level of economic analysis characteristic of final rules.

• In 1996, comments received in response to the NPRM gave additional compliance costs per type certification in then-current dollars that ranged from $331,412 for instrumentation costs plus $35,029 for testing and analysis, to an undifferentiated $1,000,000 per type certification project.

• For this final rule evaluation, the baseline for cost comparisons is the estimate of the current cost of type certification using minimum stall speed as the reference datum for a typical part 25 airplane. Building on the NPRM, the comments to the Docket, and the clarifications and updates, this final rule evaluation estimates typical additional compliance costs of about $130,000 for a type certification program conducted at 1-g for a part 25 airplane, expressed in 1999 dollars.

• During the time the FAA has been accepting certification at 1-g, additional costs of instrumentation have become small to negligible. Falling instrumentation costs and rising instrumentation capability have resulted in acceptable test data being achieved by adding as little additional instrumentation as one accelerometer to the test equipment required for certification at minimum stall speed. (The estimated uninstalled cost of an accelerometer appropriate to this use is the minimal cost of $500 to $2,000, in 1999 dollars. Further, accelerometer and gyroscopic components already present in the inertial navigation systems incorporated on modern transport category airplanes are the fundamental starting point for instrumentation sufficient to measure a 1-g stall speed.)

In summary, for a typical part 25 airplane, the current industry practice of type certification using 1-g stall as the reference datum adds a minor cost ($130,000) for flight-testing and analysis to the costs of the baseline alternative of type certification using minimum speed stall. This practice also is expected to add very minor or no cost for additional instrumentation beyond that required for the type certification baseline.

This final evaluation notes the possibility, also raised in the NPRM and in the 1999 clarifications and updates, that codification of this ongoing practice, and its consequent extension to all U.S. manufacturers and to all part 25 airplanes they will certificate in the future, could have an adverse impact on marketing efforts by manufacturers. (In general, this rule reduces the multiplying factors used to convert reference speed to minimum operational speeds by about 6 percent. When the reduced multiplying factors are applied to the 1-g stall speed, which is generally about 6 percent higher than minimum speed stall, the resulting minimum operating speeds generally will result in the same values produced by using minimum stall speed as the reference datum. However, variation is possible. This possible variation is at the heart of assertions of marketing impact. No such impact is considered in this evaluation, for the reasons that follow:

—The possible differences in operational speeds between type certification using 1-g stall speed and type certification using minimum stall speed are in the low single digits when expressed as speeds

—The very large number of possible combinations of airplane types, operational conditions, operators' services and airport characteristics forestalls practical quantitative consideration of the possible small consequences noted above

—Any operational consequence of certification at 1-g already results from ongoing industry practice and cannot also be considered to result from this rule

—The possible differences in operational speeds between type certification using 1-g stall speed and type certification using minimum stall speed are in the low single digits when expressed as speeds

Benefits/Costs Comparison

The FAA finds that this rule improves the codification of current industry practices that have evolved over a period of about 15 years. These practices already result in the benefits of the current level of safety. With one exception, this rule will add little or nothing to these benefits. The exception is the elimination of the possibility that a future part 25 airplane might not be certificated based on 1-g stall speed criteria. Removing this possibility ensures that the benefits being received cannot be reduced, thus diminishing the current level of safety. The agency has not attempted to quantify either this added benefit or the benefits already being received.

Another additional benefit of improved codification is that type certification to both FAR and JAR requirements will be simpler, more direct and consequently less costly. The agency has not attempted to quantify this harmonization benefit.

Because it is an improvement of the codification of voluntary industry practices, the FAA concludes that this rule will add little or no cost to the industry. The agency estimates that affected manufacturers already voluntarily incur costs of about $130,000 (in 1999 dollars) for each type certification project they base on 1-g stall speed criteria, beyond the costs they would incur in type certification based on minimum stall speed criteria.

The FAA concludes that while this final rule will add little or nothing to the safety benefits and the certification costs that already result from voluntary industry practices, it does add safety and harmonization benefits. Thus, the FAA believes this rule is cost effective.

Regulatory Flexibility Determination

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

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

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

be clear. For aircraft manufacturers, a small entity is one with 1,500 or fewer employees.

Evaluation of this final rule in terms of this standard shows that no current manufacturer of transport category airplanes is a small manufacturer. Although the future entry of a small manufacturer into the business of manufacturing transport category airplanes is possible, such an unusual single entrant could not be construed to equate to a ''substantial number.''

Finally, no regulatory flexibility analysis is required for this rule because it adds little or nothing to the costs that otherwise would be required for type certification of a transport category airplane by a manufacturer of any size. Therefore the impact of this rule would not be significant whether it fell on a large or on a small manufacturer.

In light of these arguments, the FAA certifies that the rule change will not have a significant economic impact on a substantial number of small entities, and a regulatory flexibility analysis is not required.

International Trade Impact Analysis

The Trade Agreement Act of 1979 prohibits Federal agencies from engaging in any standards or 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.

Because this rule is a part of a harmonization process that will result in a single FAA/JAA regulatory standard, it reduces a barrier to international trade. Thus, in accordance with the above statute, the FAA has assessed the potential effect of this final rule and has determined that it will support the Act.

Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act of 1995 (the Act), enacted as Public Law 104–4 on March 22, 1995 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 a $100 million or more expenditure (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. Therefore, the assessment requirements of Title II of the Unfunded Mandates Reform Act of 1995 do not apply.

Executive Order 3132, 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 State, or the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, we determined that this final rule does not have federalism implications.

Regulations Affecting Interstate Aviation in Alaska

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

Environmental Analysis

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

Energy Impact

The energy impact of this amendment has been assessed in accordance with the Energy Policy and Conservation Act (EPCA) Public Law 94–163, as amended (42 U.S.C. 6362) and FAA Order 1053.1. It has been determined that the final rule is not a major regulatory action under the provisions of the EPCA.

List of Subjects

14 CFR Part 1

Air transportation.

14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 97

Air traffic control, Airports, Navigation (air), Weather.

The Amendments

In consideration of the foregoing, the Federal Aviation Administration (FAA) amends Chapter I of Title 14 Code of Federal Regulations (CFR) parts 1, 25, and 97 as follows:

PART 1—DEFINITIONS AND ABBREVIATIONS

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

Authority: 49 U.S.C. 106(g), 40113, 44701.

2. Section 1.1 is amended by adding new definitions in alphabetical order to read as follows:

§ 1.1 General definitions.

* * * * *

Final takeoff speed means the speed of the airplane that exists at the end of the takeoff path in the en route configuration with one engine inoperative.

* * * * *

Reference landing speed means the speed of the airplane, in a specified landing configuration, at the point where it descends through the 50 foot height in the determination of the landing distance.

* * * * *

3. Section 1.2 is amended by adding new abbreviations in alphabetical order to read as follows:

§ 1.2 Abbreviations and symbols.

* * * * *

V_{FTO} means final takeoff speed.

* * * * *

V_{REF} means reference landing speed.

* * * * *

V_{SR} means reference stall speed.

V_{SR0} means reference stall speed in the landing configuration.

V_{SR1} means reference stall speed in a specific configuration.

V_{SW} means speed at which onset of natural or artificial stall warning occurs.

* * * * *

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

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

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

5. Section 25.103 is revised to read as follows:

§ 25.103 Stall speed.

(a) The reference stall speed, $V_{SR,}$ is a calibrated airspeed defined by the

applicant. V_{SR} may not be less than a 1-g stall speed. V_{SR} is expressed as:

$$V_{SR} \geq \frac{V_{CL_{MAX}}}{\sqrt{n_{ZW}}}$$

where:

$V_{CL_{MAX}}$ = Calibrated airspeed obtained when the load factor-corrected lift coefficient

$$\left(\frac{n_{ZW}W}{qS}\right)$$

is first a maximum during the maneuver prescribed in paragraph (c) of this section. In addition, when the maneuver is limited by a device that abruptly pushes the nose down at a selected angle of attack (*e.g.*, a stick pusher), $V_{CL_{MAX}}$ may not be less than the speed existing at the instant the device operates;

n_{ZW} = Load factor normal to the flight path at $V_{CL_{MAX}}$

W = Airplane gross weight;

S = Aerodynamic reference wing area; and

q = Dynamic pressure.

(b) V_{CLMAX} is determined with:

(1) Engines idling, or, if that resultant thrust causes an appreciable decrease in stall speed, not more than zero thrust at the stall speed;

(2) Propeller pitch controls (if applicable) in the takeoff position;

(3) The airplane in other respects (such as flaps and landing gear) in the condition existing in the test or performance standard in which V_{SR} is being used;

(4) The weight used when V_{SR} is being used as a factor to determine compliance with a required performance standard;

(5) The center of gravity position that results in the highest value of reference stall speed; and

(6) The airplane trimmed for straight flight at a speed selected by the applicant, but not less than $1.13V_{SR}$ and not greater than $1.3V_{SR}$.

(c) Starting from the stabilized trim condition, apply the longitudinal control to decelerate the airplane so that the speed reduction does not exceed one knot per second.

(d) In addition to the requirements of paragraph (a) of this section, when a device that abruptly pushes the nose down at a selected angle of attack (*e.g.*, a stick pusher) is installed, the reference stall speed, V_{SR}, may not be less than 2 knots or 2 percent, whichever is greater, above the speed at which the device operates.

6. Section 25.107 is amended by revising paragraphs (b)(1) introductory text, b(1)(ii), (b)(2) introductory text, b(2)(ii), (c)(1) and (c)(2), and by adding new paragraphs (c)(3) and (g) to read as follows:

§ 25.107 Takeoff speeds.

* * * * *

(b) * * *

(1) $1.13V_{SR}$ for—

* * * * *

(ii) Turbojet powered airplanes without provisions for obtaining a significant reduction in the one-engine-inoperative power-on stall speed;

(2) $1.08V_{SR}$ for—

* * * * *

(ii) Turbojet powered airplanes with provisions for obtaining a significant reduction in the one-engine-inoperative power-on stall speed; and

* * * * *

(c)* * *

(1) V_{2MIN};

(2) V_R plus the speed increment attained (in accordance with § 25.111(c)(2)) before reaching a height of 35 feet above the takeoff surface; and

(3) A speed that provides the maneuvering capability specified in § 25.143(g).

* * * * *

(g) V_{FTO}, in terms of calibrated airspeed, must be selected by the applicant to provide at least the gradient of climb required by § 25.121(c), but may not be less than—

(1) 1.18 V_{SR}; and

(2) A speed that provides the maneuvering capability specified in § 25.143(g).

7. Section 25.111 is amended by revising paragraph (a) introductory text to read as follows:

§ 25.111 Takeoff path.

(a) The takeoff path extends from a standing start to a point in the takeoff at which the airplane is 1,500 feet above the takeoff surface, or at which the transition from the takeoff to the en route configuration is completed and V_{FTO} is reached, whichever point is higher. In addition—

* * * * *

8. Section 25.119 is amended by revising paragraph (b) to read as follows:

§ 25.119 Landing climb: All-engines-operating.

* * * * *

(b) A climb speed of not more than V_{REF}.

9. Section 25.121 is amended by revising paragraphs (c) introductory text, (d) introductory text, (d)(2) and (d)(3), and by adding paragraph (d)(4) to read as follows:

§ 25.121 Climb: One-engine-inoperative.

* * * * *

(c) *Final takeoff.* In the en route configuration at the end of the takeoff path determined in accordance with § 25.111, the steady gradient of climb may not be less than 1.2 percent for two-engine airplanes, 1.5 percent for three-engine airplanes and 1.7 percent for four-engine airplanes, at V_{FTO} and with

* * * * *

(d) *Approach.* In a configuration corresponding to the normal all-engines-operating procedure in which V_{SR} for this configuration does not exceed 110 percent of the V_{SR} for the related all-engines-operating landing configuration, the steady gradient of climb may not be less than 2.1 percent for two-engine airplanes, 2.4 percent for three-engine airplanes, and 2.7 percent for four engine airplanes, with

* * * * *

(2) The maximum landing weight;

(3) A climb speed established in connection with normal landing procedures, but not more than 1.4 V_{SR}; and

(4) Landing gear retracted.

10. Section 25.125 is amended by revising paragraph (a)(2) to read as follows:

§ 25.125 Landing.

(a) * * *

(2) A stabilized approach, with a calibrated airspeed of V_{REF}, must be maintained down to the 50 foot height. V_{REF} may not be less than

(i) 1.23 V_{SR0};

(ii) V_{MCL} established under § 25.149(f); and

(iii) A speed that provides the maneuvering capability specified in § 25.143(g).

* * * * *

11. Section 25.143 is amended by adding a new paragraph (g) to read as follows:

§ 25.143 General.

* * * * *

(g) The maneuvering capabilities in a constant speed coordinated turn at forward center of gravity, as specified in the following table, must be free of stall warning or other characteristics that might interfere with normal maneuvering:

Configuration	Speed	Maneuvering bank angle in a coordinated turn	Thrust power setting
Takeoff	V_2	30°	Asymmetric WAT-Limited.[1]
Takeoff	$^2V_2$ + XX	40°	All-engines-operating climb.[3]
En route	V_{FTO}	40°	Asymmetric WAT-Limited.[1]
Landing	V_{REF}	40°	Symmetric for −3° flight path angle.

[1] A combination of weight, altitude, and temperature (WAT) such that the thrust or power setting produces the minimum climb gradient specified in § 25.121 for the flight condition.
[2] Airspeed approved for all-engines-operating initial climb.
[3] That thrust or power setting which, in the event of failure of the critical engine and without any crew action to adjust the thrust or power of the remaining engines, would result in the thrust or power specified for the takeoff condition at V_2, or any lesser thrust or power setting that is used for all-engines-operating initial climb procedures.

12. Section 25.145 is amended by revising paragraphs (a) introductory text, (a)(1), (b)(1), (b)(4), (b)(6), and (c) introductory text to read as follows:

§ 25.145 Longitudinal control.

(a) It must be possible, at any point between the trim speed prescribed in § 25.103(b)(6) and stall identification (as defined in § 25.201(d)), to pitch the nose downward so that the acceleration to this selected trim speed is prompt with

(1) The airplane trimmed at the trim speed prescribed in § 25.103(b)(6);

* * * * *

(b) * * *

(1) With power off, flaps retracted, and the airplane trimmed at 1.3 V_{SR1}, extend the flaps as rapidly as possible while maintaining the airspeed at approximately 30 percent above the reference stall speed existing at each instant throughout the maneuver.

* * * * *

(4) With power off, flaps retracted, and the airplane trimmed at 1.3 V_{SR1}, rapidly set go-around power or thrust while maintaining the same airspeed.

* * * * *

(6) With power off, flaps extended, and the airplane trimmed at 1.3 V_{SR1}, obtain and maintain airspeeds between V_{SW} and either 1.6 V_{SR1} or V_{FE}, whichever is lower.

(c) It must be possible, without exceptional piloting skill, to prevent loss of altitude when complete retraction of the high lift devices from any position is begun during steady, straight, level flight at 1.08 V_{SR1} for propeller powered airplanes, or 1.13 V_{SR1} for turbojet powered airplanes, with—

* * * * *

§ 25.147 [Amended]

13. Section 25.147 is amended in paragraphs (a) introductory text, (a)(2), (c) introductory text, and (d) by revising the expression ''1.4 V_{S1}'' to read ''1.3 V_SR1.''

§ 25.149 [Amended]

14. Section 25.149 is amended in paragraph (c) introductory text by revising the expression ''1.2 V_S'' to read ''1.13 V_{SR}.''

§ 25.161 [Amended]

15. Section 25.161 is amended in paragraphs (b), (c)(1), (c)(2), (c)(3) and (d) introductory text by revising the expression ''1.4 V_{S1}'' to read ''1.3 V_{SR1}''; and in paragraph (e)(3) by revising the expression ''0.013 V_{S0}^2'' to read ''0.013 V_{SR0}^2.''

§ 25.175 [Amended]

16. Section 25.175 is amended: a. In paragraphs (a)(2), (b)(1) introductory text, (b)(2) introductory text, (b)(3) introductory text and (c)(4) by revising the expression ''1.4 V_{S1}'' to read ''1.3 V_{SR1}'';

b. In paragraph (b)(2)(ii) by revising the expression ''V_{MO} + 1.4 V_{S1}/2'' to read ''(V_{MO} + 1.3 V_{SR1})/2'';

c. In paragraph (c) introductory text by revising the expressions ''1.1 V_{S1}'' to read ''V_{SW}'' and ''1.8 V_{S1}'' to read ''1.7 V_{SR1}'';

d. In paragraph (d) introductory text by revising the expressions ''1.1 V_{SO}'' to read ''V_{SW}'' and ''1.3 V_{S0}'' to read ''1.7 V_{SR0}''; and

e. In paragraph (d)(5) by revising the expression ''1.4 V_{S0}'' to read ''1.3 V_{SR0}.''

§ 25.177 [Amended]

17. Section 25.177 is amended in paragraph (c) by revising the expression ''1.2 V_{S1}'' to read ''1.13 V_{SR1}.''

§ 25.181 [Amended]

18. Section 25.181 is amended in paragraphs (a) introductory text and (b) by revising the reference to ''1.2 V_S'' to read ''1.13 V_{SR}.''

19. Section 25.201 is amended by revising paragraphs (a)(2) and (b)(4) to read as follows:

§ 25.201 Stall demonstration.

(a) * * *

(2) The power necessary to maintain level flight at 1.5 V_{SR1} (where V_{SR1} corresponds to the reference stall speed at maximum landing weight with flaps in the approach position and the landing gear retracted).

(b) * * *

(4) The airplane trimmed for straight flight at the speed prescribed in § 25.103(b)(6).

* * * * *

20. Section 25.207 is amended by revising paragraphs (b) and (c), and by adding new paragraphs (d), (e), and (f) to read as follows:

§ 25.207 Stall warning.

* * * * *

(b) The warning must be furnished either through the inherent aerodynamic qualities of the airplane or by a device that will give clearly distinguishable indications under expected conditions of flight. However, a visual stall warning device that requires the attention of the crew within the cockpit is not acceptable by itself. If a warning device is used, it must provide a warning in each of the airplane configurations prescribed in paragraph (a) of this section at the speed prescribed in paragraphs (c) and (d) of this section.

(c) When the speed is reduced at rates not exceeding one knot per second, stall warning must begin, in each normal configuration, at a speed, V_{SW}, exceeding the speed at which the stall is identified in accordance with § 25.201(d) by not less than five knots or five percent CAS, whichever is greater. Once initiated, stall warning must continue until the angle of attack is reduced to approximately that at which stall warning began.

(d) In addition to the requirement of paragraph (c) of this section, when the speed is reduced at rates not exceeding one knot per second, in straight flight with engines idling and at the center-of-gravity position specified in § 25.103(b)(5), V_{SW}, in each normal configuration, must exceed V_{SR} by not less than three knots or three percent CAS, whichever is greater.

(e) The stall warning margin must be sufficient to allow the pilot to prevent

stalling (as defined in § 25.201(d)) when recovery is initiated not less than one second after the onset of stall warning in slow-down turns with at least 1.5g load factor normal to the flight path and airspeed deceleration rates of at least 2 knots per second, with the flaps and landing gear in any normal position, with the airplane trimmed for straight flight at a speed of 1.3 V_{SR}, and with the power or thrust necessary to maintain level flight at 1.3 V_{SR}.

(f) Stall warning must also be provided in each abnormal configuration of the high lift devices that is likely to be used in flight following system failures (including all configurations covered by Airplane Flight Manual procedures).

§ 25.231 [Amended]

21. Section 25.231 is amended in paragraph (a)(2) by revising the word ''altitude'' to read ''attitude'' and by revising the expression ''80 percent of V_{S1}'' to read ''75 percent of V_{SR1}.''

§ 25.233 [Amended]

22. Section 25.233 is amended in paragraph (a) by revising the reference ''0.2 V_{S0}'' to read ''0.2 V_{SR0}.''

§ 25.237 [Amended]

23. Section 25.237 is amended in paragraphs (a), (b)(1), and (b)(2) by revising the reference ''0.2 V_{S0}'' to read ''0.2 V_{SR0}.''

24. Section 25.735 is amended by revising paragraphs (f)(2) and (g) to read as follows:

§ 25.735 Brakes and braking systems.

* * * * *

(f) * * *

(2) Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel-brake assembly may be derived from the following formula, which must be modified in cases of designed unequal braking distributions.

$$KE = \frac{0.0443WV^2}{N}$$

where—

KE = Kinetic energy per wheel (ft.-lb.);

W = Design landing weight (lb.);

V = $V_{REF}/1.3$

VREF = Airplane steady landing approach speed, in knots, at the maximum design landing weight and in the landing configuration at sea level; and

N = Number of main wheels with brakes.

* * * * *

(g) In the landing case, the minimum speed rating of each main wheel-brake assembly (that is, the initial speed used in the dynamometer tests) may not be more than the V used in the determination of kinetic energy in accordance with paragraph (f) of this section, assuming that the test procedures for wheel-brake assemblies involve a specified rate of deceleration, and, therefore, for the same amount of kinetic energy, the rate of energy absorption (the power absorbing ability of the brake) varies inversely with the initial speed.

* * * * *

§ 25.773 [Amended]

25. Section 25.773 is amended in paragraph (b)(1)(i) by revising the expression ''1.6 V_{S1}'' to read ''1.5 V_{SR1}.''

§ 25.1001 [Amended]

26. Section 25.1001 is amended in paragraphs (c)(1) and (c)(3) by revising the expression ''1.4 V_{S1}'' to read ''1.3 V_{SR1}.''

§ 25.1323 [Amended]

27. Section 25.1323 is amended in paragraph (c)(1) by revising the expression ''1.3 V_{S1}'' to read ''1.23 V_{SR1}'' and in paragraph (c)(2) by revising the expression ''1.3 V_{S0}'' to read ''1.23 V_{SR0}.''

§ 25.1325 [Amended]

28. Section 25.1325 is amended in paragraph (e) by revising the expressions ''1.3 V_{S0}'' and ''1.8 V_{S1}'' to read ''1.23 V_{SR0}'' and ''1.7 V_{SR1},'' respectively.

§ 25.1587 [Amended]

29. Section 25.1587 is amended by in paragraph (b)(2) by revising the expression ''V_S'' to read ''V_{SR}.''

PART 97—STANDARD INSTRUMENT APPROACH PROCEDURES

30. The authority citation for part 97 is revised to read as follows:

Authority: 49 U.S.C. 106(g), 40103, 40106, 40113, 40114, 40120, 44502, 44514, 44701, 44719, 44721–44722.

31. Section 97.3 is amended by revising the first two sentences of paragraph (b) introductory text to read as follows:

§ 97.3 Symbols and terms used in procedures.

* * * * *

(b) Aircraft approach category means a grouping of aircraft based on a speed of V_{REF}, if specified, or if V_{REF} is not specified, 1.3 V_{S0} at the maximum certificated landing weight. V_{REF}, V_{S0}, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.

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Issued in Washington, DC on November 14, 2002.

Marion C. Blakey,

Administrator.

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