Federal Aviation Administration
Aviation Rulemaking Advisory Committee

Transport Airplane and Engine Issue Area
Powerplant Installation Harmonization Working Group

Task 10 – Continuous Airworthiness Assessments

Task Assignment

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[Notices]
[Page 81948-81949]
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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee Transport Airplane and Engine Issues--New Task

AGENCY: Federal Aviation Administration (**FAA**), DOT.

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

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

FOR FURTHER INFORMATION CONTACT: John McGraw, 1601 Lind Ave., Renton, Washington 98055-4056, 425-227-1171, john.mcgraw@**faa**.gov.

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.

The Task

This notice is to inform the public that the **FAA** has asked ARAC to provide advice and recommendations on the following task:

Task: Review the comments received the response to the Notice of Availability of proposed Advisory Circular (AC 39.XX), titled ``Continued Airworthiness Assessments of Powerplant and Auxiliary Power Unit Installation on Transport Category Airplanes.'' Provide advice and recommendations on the task, recommend disposition of the comments that are inappropriate for incorporation in the proposed AC, and provide recommended revised language, in paragraph form, to address those comments that have merit and warrant incorporation in the proposed AC.

Schedule: The recommendations should be forwarded to the **FAA** by September 1, 2001.

ARAC Acceptance of Tasks

ARAC has accepted the task and has chosen to assign the tasks to the newly formed Continued Airworthiness Assessments Working Group, Transport Airplane and Engine Issues. The working group will serve as staff to ARAC and assist in the analysis of the assigned task. Working group recommendations must be reviewed and approved by ARAC. If ARAC accepts the working group's recommendations, it forwards them to the **FAA** as ARAC recommendations.

Working Group Activity

The Continued Airworthiness Assessments Working Group is expected to comply with the procedures adopted by ARAC. As part of the procedures, the working group is expected to:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan, for consideration at the meeting of the ARAC Transport Airplane and Engine Issues held following publication of this notice.
2. Give a detailed conceptual presentation of the proposed recommendations.
3. Provide a status report at each meeting of the ARAC held to consider Transport Airplane and Engine Issues.

Participation in the working Group

The newly formed Continued Airworthiness Assessment 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 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 task and stating the expertise he or she would bring to the working group. All requests to participate must be received no later than January 20, 2001. 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 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 support the ability of the working group in meeting any assigned deadlines. Members are expected to keep their management chain and those they may represent 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 approval.

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 the ARAC is necessary and in the public interest in connection with the performance of duties imposed on the **FAA** by law.

Meetings of the ARAC will be open to the public. Meetings of the Continued Airworthiness Assessments Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Dated: Issued in Washington, DC, on December 21, 2000.
Anthony F. Fazio,
Executive Director, Aviation Rulemaking Advisory Committee.
[FR Doc. 00-32955 Filed 12-21-00; 4:43 pm]
BILLING CODE 4910-13-M

Action: ARM-1

AVC-1 Signature

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Pratt & Whitney
A United Technologies Company

September 19, 2002

Federal Aviation Administration
800 Independence Avenue, SW
Washington, D.C. 20591

Attention: Mr. Nicholas Sabatini, Associate Administrator for Regulation and Certification

Subject: ARAC Recommendation, Automatic Performance Reserve

Reference: ARAC Tasking, FAA letter to C. Bolt, November 19, 1999

Dear Nick,

The Transport Airplane and Engine Issues Group is pleased to submit the following as a recommendation to the FAA in accordance with the reference tasking. This information has been prepared by the Powerplant Installation Harmonization Working Group.

- PPIHWG report – 25.904/Appendix I - Automatic Performance Reserve
- Proposed NPRM – Automatic Performance Reserve
- Proposed Advisory Material – Automatic Performance Reserve

Sincerely yours,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: Dionne Krebs – FAA-NWR
Mike Kaszycki – FAA-NWR
Effie Upshaw – FAA-Washington, D.C.
Andrew Lewis Smith - Boeing

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)

ARAC WG Report

Report from the PowerPlant Installation Harmonization Working Group

Rule Section: FAR 25.904/JAR 25X20(c) and FAR/JAR 25 Appendix I

What is the underlying safety issue addressed by the FAR/JAR?: This appendix specifies additional requirements if an applicant elects to install an engine control system that automatically increases thrust or power on the operating engine(s) if an engine fails during takeoff. With such a system installed, takeoffs would normally be made with thrust or power set at less than the maximum takeoff thrust or power. If an engine fails, the system automatically increases thrust on the operating engine(s) to the maximum takeoff thrust or power.

Compliance with the additional requirements specified in the appendix for airplane performance, system reliability, initial thrust setting, powerplant controls, and powerplant instruments allows the takeoff power or thrust obtained after operation of the engine control system to increase power or thrust to be used to meet the part 25 one-engine-inoperative airplane performance requirements. By specifying these additional requirements, and recognizing that the use of reduced takeoff thrust reduces the probability of an engine failure, this appendix ensures that incorporation of such a system provides an equivalent level of safety to that intended by the basic part 25 requirements.

What are the current FAR and JAR standards?: see Appendix 3 & Appendix 4, respectively.

What are the differences in the standards and what do these differences result in?: The differences between the two standards and the effects of differences are summarized as follows:

1. In the FAR, the initial power setting used for takeoff may not be less than 90 percent of the maximum takeoff thrust or power approved for the airplane under the existing ambient conditions. The JAR does not limit the initial power setting, but limits the thrust that can be used to show compliance with the JAR-25 airplane performance requirements to no more than 111 percent of the initial power setting. The FAR standard is more stringent because it precludes taking credit for any performance benefit associated with the automatic thrust increase when the initial takeoff power setting is less than 90 percent of the maximum takeoff thrust. At an initial power setting of 90 percent of the maximum takeoff thrust, the two standards are equivalent in terms of the resulting performance credit granted, but the JAR allows credit for further reductions in the initial power setting while the FAR does not.

   The effect of this difference is that the takeoff weight of an airplane certificated to the FAR standards may be restricted to a lesser value relative to that available to an airplane certificated to the JAR standards when the initial thrust or power setting is less than 90 percent of the maximum takeoff thrust. The operator of an airplane certificated to the FAR standards may therefore realize a potential revenue loss due to a loss of payload-carrying capability compared to an operator of an airplane certificated to the JAR standards.

2. The JAR requires that inadvertent operation of the automatic system be either of a remote probability or have no more than a minor effect on safety. The FAR does not explicitly address inadvertent operation. The JAR standard is more stringent and requires a more reliable system design.

3. For airplanes equipped with limiters that automatically prevent engine operating limits from being exceeded under existing ambient conditions, a means other than normal use of the power or thrust levers may be used to manually increase power or thrust to the maximum power or thrust. The FAR is more stringent in that it requires that other means to be located on or forward of the thrust or power levers and that it meet the requirements of § 25.177(a), (b), and (c). The JAR only requires the other means to be in an accessible position on or close to the thrust or power levers. This rule difference can lead to differences in the placement of the means used to manually increase thrust or power between airplanes certificated under the different standards. This potential feature is no longer considered required and has been removed. The allowance was introduced to accommodate existing designs at the time the original rule was introduced.

4. The FAR uses the term "Automatic Takeoff Thrust Control System (ATTCS)" for such a system, while the JAA uses the term "Automatic Reserve Performance (ARP) System." This difference is in nomenclature only and does not affect the requirements or stringency of the standards.

5. Another editorial difference is that the FAR combines the performance and system reliability in one section, § I25.3, while the JAR separates these items into two paragraphs, JAR I25.3 and I25.4. As a result, the numbering of the succeeding paragraphs differ between the FAR and the JAR. Various other editorial differences exist as well, but they do not affect the application of the standards.

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?: The proposed action is to harmonize the standards by using the least costly means of ensuring that the underlying safety issue is addressed. Also, the harmonized standard would be updated to include appropriate safety standards for additional capabilities that have been incorporated into more recent system designs for which the current FAR or JAR standards do not contain adequate or appropriate safety standards. In accordance with § 21.16, the FAA has issued special conditions for several airplane types to provide appropriate safety standards for these additional capabilities. These additional capabilities include the use of an engine control system to increase power when an engine fails during or prior to a go-around. The additional standards proposed here are based on those special conditions as well as similar special conditions issued by the JAA.

The changes addressed in this proposal are:

- Use of the term **Automatic Performance Reserve (APR)** as the harmonized name for a system that automatically resets power or thrust on the operating engine(s) when an engine fails during a takeoff or go-around. A majority of airplane and engine manufacturers has been using this term rather than the terms "Automatic Takeoff Thrust Control System (ATTCS)" or "Automatic Reserve Performance (ARP) System" used in the current FAA and JAA standards, respectively. In the proposed harmonized standard, "Automatic Performance Reserve (APR)" would replace "Automatic Takeoff Thrust Control System (ATTCS)" throughout § 25.904 and Appendix I to part 25, and replaces "Automatic Reserve Performance (ARP) System" throughout JAR 25X20(c) and Appendix I to JAR-25. This change would not affect the level of safety intended by the standards.

- **Harmonization of editorial differences.** As an editorial change, the current § I25.3, "Performance and System Reliability Requirements," would be split into two sections: § I25.3 "Performance Requirements," and § I25.4 "Reliability Requirements." The remaining current §§ I25.4 through I25.6 would be renumbered as §§ I25.5 through I25.7. For the most part, the harmonized standard would be based editorially on the current FAR standard. Miscellaneous editorial changes are proposed to improve clarity.

- **Use of APR for go-around.** As noted above, special conditions have been issued for several airplane types (e.g., BAe Systems Jetstream 41, CASA C-295, Dassault Falcon 2000, DeHavilland DHC8-400, Bombardier CRJ 700) to approve the use of an APR system for go-around. Use of such a system for go-around extends engine life and reduces the probability of an engine failure by allowing a lower power or thrust level to be set when conducting a go-around with all engines operating. If an engine fails during the go-around, the APR system will automatically increase power on the operating engine(s) to the go-around power or thrust setting without any action by the pilot. Installation of an APR system for go-around allows the use of the go-around power or thrust setting to be used to show compliance with the one-engine-inoperative approach climb requirements of § 25.121(d) even though a reduced power setting is used for normal operations (i.e., with all engines operating).

  Although APR for go-around is very similar to APR for takeoff, there are three important differences that cause the requirements applicable to takeoff, which are the standards currently included in appendix I, inadequate to address the safety issues associated with a go-around. First, a go-around may be initiated with an engine previously shut down or otherwise made inoperative, in addition to the case where the engine failure occurs during the go-around. Second, the I25.5(b)(3) requirement for a means for the flightcrew to verify before takeoff that the system is in a condition to operate does not ensure adequate reliability or flightcrew awareness regarding the operability of the system. Third, as noted in the preamble to Amendment 25-62 to 14 CFR part 25, which is the amendment that added Appendix I to part 25, flightcrew workload issues precluded expanding the scope of the standards to include phases of flight other than takeoff. The preamble specifically referred to go-around, where it was stated:

> "In regard to ATTCS credit for approach climb and go-around maneuvers, current regulations preclude a higher power for the approach climb (§ 25.121(d)) than for the landing climb (§ 25.119). The workload required for the flightcrew to monitor and select from multiple in-flight power settings in the event of an engine failure during a critical point in the approach, landing, or go-around operations is excessive. Therefore, the FAA does not agree that the scope of the amendment should be changed to include the use of ATTCS for anything except the takeoff phase."

To address these issues, the following changes to appendix I are proposed:

The critical time interval (CTI), during which it must be extremely improbable for the concurrent existence of an engine and APR system failure, would be redefined for the go-around case. The CTI for the go-around case would ensure that it is extremely improbable to violate a flight path based on the §/JAR 25.121(d) one-engine-inoperative approach climb gradient requirement. This critical time interval would take into account that the engine may be inoperative before initiating the go-around, or it may fail during the go-around.

The working group considered various methods for defining the CTI for go-around, including the methods used in the previously mentioned FAA special conditions as well as similar certification requirements for these systems that were established by the JAA and Transport Canada. In examining the different methods and their effects on APR system design, the working group found that a rigorous CTI definition is unnecessary. The CTI, as only one of the criteria used to establish the reliability requirements for the system, is not limiting for current or envisaged future designs. Another reliability criterion contained in the proposed harmonized standard, the consideration of the elapsed time since verification that the system is in a condition to operate, is always more critical than the CTI. For some APR system elements, verification of operability can only be performed prior to commencing the flight, so the elapsed time since verification includes the entire duration of the flight. The short duration of the CTI has a very minor effect on the overall time at risk and therefore on the calculated APR system reliability.

Because the CTI for go-around has little or no effect on the design of the APR system, it could be argued that there is no need to require it to even be considered. However, to retain consistency with the takeoff APR requirements, provide visibility to the issue, and to cover potential future designs for which the CTI could be a critical factor, the working group is not proposing to exclude a CTI value for go-around. Instead, the use of a single, conservative CTI value of 120 seconds is proposed. This value is more stringent than would be obtained through any of the more rigorous methods that have been used, but greatly simplifies the task of showing compliance. For comparison purposes, the CTI for the BAe Systems Jetstream 41 & Bombardier CRJ700 airplanes were determined to be 26 & 35 seconds respectively using the complex method specified in the FAA special conditions.

To address potential designs where the use of such a conservative CTI value would be unduly penalizing, the proposed standard would allow the use of a rational analysis to justify using a shorter time interval. An acceptable method for conducting a rational analysis would be provided in a proposed AC/ACJ (attached), and would be based on the method given in the FAA special conditions. Also, it should be pointed out in the preamble to the proposed regulatory amendment that since the basis of the proposed CTI value is that 120 seconds is conservative and not limiting, if it turns out that this value is not conservative and the rationally derived CTI would be limiting, then a rationally derived CTI must be used.

(1) This definition of the critical time interval for go-around would be added as a new §/JAR I25.2(b)(2). The current §/JAR 25.5(b) would be reformatted such that the definition of the critical time interval for takeoff would become §/JAR I25.2(b)(1).

(2) To address the issue of the verification of system operability, a new §/JAR I25.4(d) would be added to require the safety analysis to include consideration, as applicable, of an APR system failure occurring after the time at which the flight crew last verifies that the APR system is in a condition to operate until the end of the critical time interval.

(3) To address the crew workload issues, a new §/JAR 25.5(b) would be added to require, for approval of an APR system for go-around, the same thrust or power setting procedure to be used for go-around initiated with either all engines operating or with one engine inoperative. This requirement is intended to ensure the same flightcrew action is used to set go-around power or thrust regardless of whether or not an engine is inoperative. As stated in the preamble to Amendment 25-62, the flightcrew cannot be expected to select, set, and monitor from multiple power settings in the event of an engine failure during a critical point in the approach, landing, or go-around.

In addition to the change noted above, the following rule sections (as renumbered under the proposal to reformat the FAR to harmonize with the JAR) would be amended to reference go-around in order to make the requirements applicable to go-around if that capability is sought by the applicant: § 25.904 (JAR 25X20(c) would be removed), §/JAR I25.1(a), §/JAR 25.2(a), §/JAR 25.3(a), §/JAR 25.3(b), §/JAR I25.5(a), I25.5(b), §/JAR 25.6(b)(1), §/JAR 25.6(b)(2), and §/JAR 25.7(b).

- **Thrust or power setting**. The proposed harmonized standard would replace the FAR limitation that the initial thrust or power setting must not be less than 90 percent of the thrust or power set by the APR system after an engine failure with the JAR requirement that the thrust used to show compliance with the applicable one-engine-inoperative climb requirements not be greater than 111 percent of the thrust obtained at the initial thrust or power setting. Both standards are intended to ensure an adequate climb capability with all engines operating and to limit the degradation of performance if the critical engine fails and the APR system fails to apply maximum takeoff thrust or power on the operating engine(s).

The FAR limitation was also driven by pilot workload concerns, similar to the workload concerns with extending APR capability to cover the go-around phase of flight. The preamble to Amendment 25-62 states:

> "The FAA has not restricted ATTCS operations where airplane performance is based on an approved "derate" rating which has corresponding engine and airplane limits approved for use under all weight, altitude, and temperature (WAT) conditions. However, the FAA has not allowed the reduced thrust (assumed temperature or weight decrement method) operations to be combined with ATTCS because the resulting flight procedures would increase the pilot workload by creating an infinite number of initial all-engine and engine-failed thrust settings. The increased workload could lead to performance computation error, and create confusion for the crews' workload during a critical high workload engine failure situation. Operationally, noise abatement procedures have already created another set of thrust settings which must be monitored and set. The combination would substantially increase exposure to performance limiting condition, and this clearly would not be equivalent to current regulations, which are based on a single thrust setting for takeoff."

Since the time that was written, the FAA has allowed reduced thrust operations with the APR system operating, but has not allowed the thrust or power increase provided by the APR system after an engine failure to be used to show compliance with the airplane performance requirements. The proposed harmonized standard would allow performance credit for a thrust or power increase limited to 111 percent of the initial thrust or power set at the beginning of the takeoff or go-around. A thrust or power increase of 111 percent is equivalent to the increase achieved in going from an initial setting of 90 percent to 100 percent of the thrust or power set by the APR system after an engine failure.

The pilot workload issue would be the same for an initial thrust or power setting of 89 percent of the maximum takeoff thrust or power as it would for an initial thrust or power setting of 90 percent. During the critical time interval it must be extremely improbable for a combined engine and APR system failure. This requirement provides sufficient time for the flightcrew to determine if additional thrust or power is needed in the event of a combined engine and APR system failure. Current § I25.5(b)(2), which would be redesignated § I25.6(b)(1) already requires that the system allow manual increase or decrease of the thrust or power up to the maximum takeoff thrust or power. There is no need for the flightcrew to determine and set the specific one-engine-inoperative thrust or power setting that would normally be set by a functioning APR system as long as the appropriate thrust or power setting limits are displayed on the relevant cockpit instrument displays.

- **Inadvertent operation**. The proposed harmonized standard would include the additional JAA requirement regarding the potential for: inadvertent operation. The current JAR I25.4(c) would be adopted as harmonized §/JAR I25.4(c).

- **Means to deactivate**. In recognition that modern FADEC controls have the APR system as an integral part of the control and hence abnormalities or apparent inadvertent operation indicates a basic control function fault or failure, a dedicated means to deactivate the APR system may not be required. Reducing power or thrust to idle or shutting down the engine may be the appropriate action. In the proposed harmonized standard, current § I25.5(b)(4) would be revised to indicate that a means to deactivate the automatic function need not be provided if it can be shown that such a means is unnecessary for safety. Typically, this would involve substantiation the APR system without a switch can comply with §§/JAR 25.1301 and 25.1309 and that a deactivation means will never be needed in order to maintain the same level of safety as would be present if a switch were available.

What should the harmonized standard be?: See below

Proposed text of harmonized standard: See Appendix 1.

How does this proposed standard address the underlying safety issue?: It continues to ensure that incorporation of such a system provides a level of safety intended by the basic Part 25 requirements, adopting the appropriate existing FAR/JAR standards and adding safety standards from applicable special conditions) issued for capabilities added since the standards were adopted.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: The proposed standard maintains the level of safety by incorporating existing accepted regulatory requirements and adds the JAR requirement relative to inadvertent operation of the system.

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, including any applicable special conditions.

What other options have been considered and why were they not selected?: The harmonization of the most stringent of the FAR / JAR material was considered for the 'fast track' process. This option was not pursued because it did not address the additional capability of APR for go-around. The majority of recently certificated aircraft with an APR system provide this capability and have required special conditions for airworthiness approval.

The group also considered addressing APR credit beyond the take-off / go-around power set regime (e.g., Climb power to Maximum Continuous power).
The group decided that this change could not be made within the schedule defined for the Fast Track Harmonization Program.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes and manufacturers of the engines and engine power control systems for those airplanes that automatically reset thrust or power on the operating engine(s) in the event of the failure of an engine 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 advisory material in Advisory Circulars 25-13 and 25-7A would need to be revised to reflect the changes in the standards. The proposed revisions are included as Appendix 2 to this report. An AC to assist in the interpretation of the criteria contained within the proposed rule, particularly a rational analysis method to define the CTI for go-around, would be beneficial but not a condition to publishing the new / revised standard.

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, FTHWG.

What is the cost impact of complying with the proposed standard?:
The proposed standards offer more flexibility and reflect currently accepted practice in compliance with the current standards as augmented by the issuance of special conditions. There should be a reduction in certification cost.

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. However, due to the change in categorization of this project from category 1 (envelope) to category 3 (harmonize), additional time is needed to complete this task and coordinate a recommendation from the Power Plant Installation and Flight Test Harmonization Working Groups.

APPENDIX 1 Proposed Rule Change

§/JAR 25.904 : **Automatic performance reserve (APR) system.**
Each applicant seeking approval for an airplane equipped with an engine control system that automatically increases the power or thrust on the operating engine(s) either when an engine fails during a takeoff/take-off or during a go-around when an engine becomes inoperative either before or after the go-around is initiated must comply with the additional requirements of Appendix I of this part.

§/JAR 25 Appendix I: **Automatic Performance Reserve (APR) System**

I 25.1 *General.*

(a) This Appendix specifies additional requirements for airplanes/aeroplanes equipped with an engine control system that automatically increases thrust or power on the operating engine(s) either when an engine fails during a takeoff/take-off or during a go-around when an engine becomes inoperative either before or after the go-around is initiated, or both.

(b) With the APR system and associated systems functioning normally as designed, all applicable requirements of part 25/JAR-25, except as provided in this Appendix, must be met without requiring any action by the crew to increase thrust or power.

I 25.2 *Definitions.*

(a) Automatic Performance Reserve (APR) System. An APR system is defined as a system that automatically increases thrust or power on the operating engines(s) either when an engine fails during a takeoff/take-off or during a go-around when an engine becomes inoperative either before or after the go-around is initiated. For the purpose of showing compliance with the requirements in this appendix/Appendix, the APR system comprises all elements of equipment necessary for the control and performance of each intended function, including the engine control system and all devices, both mechanical and electrical, that sense engine failure, transmit signals, actuate fuel controls or power levers of the operating engines(s) to achieve scheduled thrust or power changes, and furnish cockpit information on system operation.

(b) Critical Time Interval. The critical time interval for an APR system that automatically increases thrust or power on the operating engine(s) after an engine fails is defined as follows:

(1) For takeoff, the critical time interval is between one second before reaching V_1, and the point on the takeoff/take-off flight path with all engines operating where, assuming a simultaneous engine and APR system failure, the resulting flight path thereafter intersects the flight path determined in accordance with §/JAR 25.115,

at not less than 400 feet above the takeoff/take-off surface. This time interval is shown in Figure 1.

(2) For go-around, the critical time interval is defined as 120 seconds. A shorter time interval may be used if justified by a rational analysis.

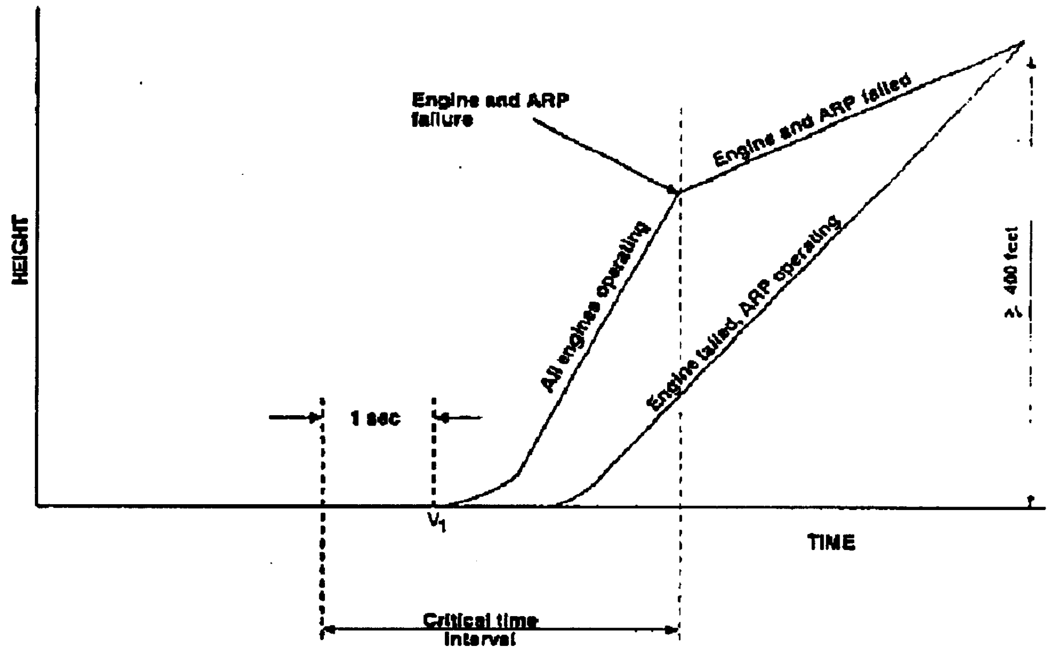


Figure A

I 25.3 *Performance Requirements.*

(a) All applicable performance requirements of part 25/JAR-25 must be met after failure of the critical engine at the most critical point during a takeoff or go-around, as applicable, with the APR system functioning.

(b) The propulsive thrust obtained from each operating engine after failure of the critical engine during take-off, or during a go-around, as applicable, used to show compliance with the one-engine-inoperative climb requirements of §/JAR 25.121(a), (b), and (d), as applicable, may not be greater than the lesser of–

(1) The actual propulsive thrust resulting from the initial setting of power or thrust controls with the APR system functioning; or

(2) 111 percent of the propulsive thrust resulting from the initial setting of power or thrust controls with the APR system failing to reset thrust or power and without any action by the crew to reset thrust or power.

I 25.4 *Reliability Requirements.*

(a) An APR system failure or a combination of failures in the APR system during the critical time interval:
  (1) That prevents the automatic insertion of the intended takeoff or go-around thrust or power, as applicable, must be improbable.
  (2) That results in a significant loss or reduction in thrust or power must be improbable.
(b) The concurrent existence of theAPR system failures regulated in section (a) above and an engine failure during the critical time interval must be extremely improbable.
(c) The inadvertent operation of the APR system must be remote or to have no more than a minor effect.
(d) The safety analysis must include consideration, as applicable, of an APR system failure occurring after the time at which the flight crew last verifies that the APR system is in a condition to operate until the end of the critical time interval.

I 25.5 *Thrust or Power Setting.*

(a) The initial thrust or power setting on each engine at the beginning of the takeoff roll or go-around, as applicable, may not be less than either of the following:

  (1) That required to permit normal operation of all safety-related systems and equipment dependent upon engine thrust or power lever position; or
  (2) That shown to comply with the applicable airplane controllability and engine operating characteristics requirements if thrust or power is increased from the initial takeoff thrust or power to the maximum available takeoff thrust or power at any point in the takeoff, or the initial thrust or power used for go-around to the maximum available go-around thrust or power at any point in the go-around, as applicable.

(b) For approval of an APR system for go-around, the thrust or power setting procedure must be the same for go-arounds initiated with all engines operating as for go-arounds initiated with one engine inoperative.

I 25.6 *Powerplant Controls.*

APPENDIX 1 Proposed Rule Change

(a) In addition to the requirements of §/JAR 25.1141, no single failure or malfunction, or probable combination thereof, of the APR system, including associated systems, may cause the failure of any powerplant function necessary for safety.
(b) The APR system must be designed to:
(1) Permit manual decrease or increase in thrust or power up to the maximum available takeoff/go-around thrust or power through the use of the normal thrust or power levers.;
(2) Provide a means to verify to the flightcrew before takeoff and before beginning an approach for landing, as applicable, that the APR system is in a condition to operate; and
(3) Provide a means for the flightcrew to deactivate the automatic function, unless it can be shown that such a means is unnecessary for safety. This means must be designed to prevent inadvertent deactivation.

I 25.7 *Powerplant Instruments*

In addition to the requirements of §/JAR 25.1305:
(a) A means must be provided to indicate when the APR system is in the armed or ready condition; and
(b) If the inherent flight characteristics of the airplane do not provide adequate warning that an engine has failed, a warning system that is independent of the APR system must be provided to give the pilot a clear warning of an engine failure during the takeoff or go-around, as applicable.
(c) Engine indications must provide sufficient information during the takeoff or go-around, as applicable, to show whether or not the engine is capable of achieving the maximum available thrust or power without exceeding engine limits.

APPENDIX 3 Current FAR Text

25.904 Automatic Takeoff Thrust Control System

Each applicant seeking approval for installation of an engine power control system that automatically resets the power or thrust on the operating engine(s) when any engine fails during the takeoff must comply with the requirements of Appendix I of this part.

APPENDIX I

I 25.1 *General*

(a) This appendix specifies additional requirements for installation of an engine power control system that automatically resets thrust or power on operating engine(s) in the event of any one engine failure during takeoff.

(b) With the ATTCS and associated systems functioning normally as designed, all applicable requirements of Part 25, except as provided in this appendix, must be met without requiring any action by the crew to increase thrust or power.

I 25.2 *Definitions*

(a) *Automatic Takeoff Thrust Control System (ATTCS).* An ATTCS is defined as the entire automatic system used on takeoff, including all devices, both mechanical and electrical, that sense engine failure, transmit signals, actuate fuel controls or power levers or increase engine power by other means on operating engines to achieve scheduled thrust or power increases, and furnish cockpit information on system operation.

(b) *Critical Time Interval.* When conducting an ATTCS takeoff, the critical time interval is between V_1 minus 1 second and a point on the minimum performance, all-engine flight path where, assuming a simultaneous occurrence of an engine and ATTCS failure, the resulting minimum flight path thereafter intersects the Part 25 required actual flight path at no less than 400 feet above the takeoff surface. This time interval is shown in the following illustration:

[Illustration]

I 25.3 *Performance and System Reliability Requirements*

The applicant must comply with the performance and ATTCS reliability requirements as follows:

(a) An ATTCS failure or a combination of failures in the ATTCS during the critical time interval:

(1) Shall not prevent the insertion of the *maximum approved takeoff* thrust or power, or must be shown to be an improbable event.

APPENDIX 3 Current FAR Text

(2) Shall not result in a significant loss or reduction in thrust or power, or must be shown to be an extremely improbable event.

(b) The concurrent existence of an ATTCS failure and an engine failure during the critical time interval must be shown to be extremely improbable.

(c) All applicable performance requirements of Part 25 must be met with an engine failure occurring at the most critical point during takeoff with the ATTCS system functioning.

I 25.4 *Thrust Setting*

The initial takeoff thrust or power setting on each engine at the beginning of the takeoff roll may not be less than any of the following:

(a) Ninety (90) percent of the thrust or power set by the ATTCS (the maximum takeoff thrust or power approved for the airplane under existing ambient conditions);

(b) That required to permit normal operation of all safety-related systems and equipment dependent upon engine thrust or power lever position; or

(c) That shown to be free of hazardous engine response characteristics when thrust or power is advanced from the initial takeoff thrust or power to the maximum approved takeoff thrust or power.

I 25.5 *Powerplant Controls*

(a) In addition to the requirements of § 25.1141, no single failure or malfunction, or probable combination thereof, of the ATTCS, including associated systems, may cause the failure of any powerplant function necessary for safety.

(b) The ATTCS must be designed to:

(1) Apply thrust or power on the operating engine(s), following any one engine failure during takeoff, to achieve the maximum approved takeoff thrust or power without exceeding engine operating limits;

(2) Permit manual decrease or increase in thrust or power up to the maximum takeoff thrust or power approved for the airplane under existing conditions through the use of the power lever. For airplanes equipped with limiters that automatically prevent engine operating limits from being exceeded under existing ambient conditions, other means may be used to increase the thrust or power in the event of an ATTCS failure provided the means is located on or forward of the power levers; is easily identified and operated under all operating conditions by a single action of either pilot with the hand that is normally used to actuate the power levers; and meets the requirements of § 25.777(a), (b), and (c);

(3) Provide a means to verify to the flightcrew before takeoff that the ATTCS is in a condition to operate; and

(4) Provide a means for the flightcrew to deactivate the automatic function. This means must be designed to prevent inadvertent deactivation.

I 25.6 *Powerplant Instruments*

APPENDIX 3 Current FAR Text

In addition to the requirements of § 25.1305:

(a) A means must be provided to indicate when the ATTCS is in the armed or ready condition; and

(b) If the inherent flight characteristics of the airplane do not provide adequate warning that an engine has failed, a warning system that is independent of the ATTCS must be provided to give the pilot a clear warning of any engine failure during takeoff.

APPENDIX 4 Current JAR Text

25X20 Applicability

(c) If the aeroplane is equipped with an engine control system that automatically resets the power or thrust on the operating engine(s) when any engine fails during take-off, additional requirements pertaining to aeroplane performance and limitations and the functioning and reliability of the system , contained in Appendix I, must be complied with.

APPENDIX I

I 25.1 General

(a) This Appendix specifies additional requirements and limitations for aeroplanes equipped with an engine_control system that automatically resets thrust or power on operating engine(s) when any engine fails during take-off, and for which performance credit is limited to that of paragraph 25.3(b) of this Appendix. When performance credit is not so limited, Special Conditions will apply .

(b) With the ARP system and associated systems functioning normally as designed, all applicable requirements of JAR-25, except as provided in this Appendix, must be met without requiring any action by the crew to increase thrust or power.

I 25.2 Definitions

(a) *Automatic Reserve Performance (ARP) System.* An ARP system is defined as a system which automatically resets thrust or power on the operating engines(s) when any engine fails during take-off. For the purpose of the requirements in this Appendix, the ARP system comprises all elements of equipment necessary for the control and performance of each intended function, including all devices, both mechanical and electrical, that sense engine failure, transmit signals and actuate fuel controls or power levers of the operating engines(s) to achieve scheduled thrust or power increases, the engine control system and devices which furnish cockpit information on system operation.

(b) *Critical Time Interval.* When conducting an ARP takeoff, the critical time interval is between one second before reaching V_1, and the point on the gross take-off flight path with all engines operating where, assuming a simultaneous engine and ARP system failure, the resulting flight path thereafter intersects the gross flight path, determined in accordance with JAR 25.115, at not less than 400 feet above the take-off surface. This definition is shown in the following figure:

[Illustration]

I 25.3 Performance requirements

All applicable performance requirements of JAR-25 must be met with the ARP system functioning normally as designed, except that the propulsive thrust obtained from each operating engine after failure of the critical engine during take-off, and the thrust at which compliance with the one-engine-inoperative climb requirements in JAR 25.121(a) and (b) is shown, must be assumed to be not greater than the lesser of–

(a) The actual propulsive thrust resulting from the initial setting of power or thrust controls with the ARP system functioning normally as designed, without requiring any action by the crew to increase thrust or power until the aeroplane has achieved a height of 400 feet above the take-off surface; or

(b) 111 percent of the propulsive thrust which would have been available at the initial setting of power or thrust controls in the event of failure of the ARP system to reset thrust power, without any action by the crew to increased thrust or power until the aeroplane has achieved a height of 400 feet above the take-off surface.

Note 1. The limitation of performance credit for ARP system operation to 111 percent of the thrust provided at the initial setting is intended to—

(i) Assure an adequate level of climb performance with all engines operating at the initial setting of power or thrust controls, and

(ii) Limit the degradation of performance in the event of a critical engine failure combined with failure of the ARP system to operate as designed

Note 2. For propeller-driven aeroplanes, propulsive thrust means the total effective propulsive force obtained from an operating engine and its propeller.

I 25.4 Reliability requirements

(See JAR 25.1309 and AMJ 25.1309)

(a) The occurrence of an ARP system failure or a combination of failures in the ARP system during the critical time interval which—

(1) Prevents the insertion of the required thrust or power, must be shown to be Improbable;

(2) Results in a significant loss or reduction in thrust or power, must be shown to be Extremely Improbable.

(a) The concurrent existence of an ARP system failure and an engine failure during the critical time interval must be shown to be Extremely Improbable.

(b) The inadvertent operation of the ARP system must be shown either to be Remote or to have no more than a minor effect.

I 25.5 Thrust or power setting

The initial setting of takeoff thrust or power controls on each engine at the beginning of the take-off roll may not be less than the lesser of:

(a) That required to permit normal operation of all safety-related systems and equipment dependent upon engine thrust or power lever position; or

(b) That shown to be free of hazardous engine response characteristics when thrust or power is increased from the initial take-off thrust or power level to the maximum approved take-off thrust or power.

APPENDIX 4 Current JAR Text

I 25.6 Powerplant controls

(a) *General*
(1) In addition to the requirements of JAR 25.1141, no single failure or malfunction, or probable combination thereof, of the ARP system, including associated systems, may cause the failure of any powerplant function necessary for safety.
(2) The ARP system must be designed to perform accurately its intended function without exceeding engine operating limits under all reasonably expected conditions.
(b) *Thrust or Power Lever Control.* The ARP system must be designed to permit manual decrease or increase in thrust or power up to the maximum thrust or power approved for use following engine failure during take-off through the use of normal thrust or power controls, except that for aeroplanes equipped with limiters that automatically prevent engine operating limits from being exceeded, other means may be used to increase thrust or power provided that the means is located in an accessible position on or close to the thrust or power levers; is easily identified and operated under all operating conditions by a single action of either pilot with the hand that is normally used to actuate the power levers.
(c) *System Control and Monitoring.* The ARP system must be designed to provide
(1) A means for checking prior to take-off that the system is in an operable condition; and
(2) A means for the flight crew to deactivate the automatic function. This means must be designed to prevent inadvertent de-activation.

I 25.7 Powerplant Instruments

(a) *System Control and Monitoring.* A means must be provided to indicate when the ARP system is in the armed or ready condition.
(b) *Engine Failure Warning.* If the inherent flight characteristics of the aeroplane do no provide adequate warning that an engine has failed, a warning system which is independent of the ARP system must be provided to give the pilot a clear warning of any engine failure during take-off.

APPENDIX 2 Proposed Existing Advisory Material Change

AC 25-13, "Reduced and Derated Takeoff Thrust (Power) Procedures"

Replace paragraph 5b with the following:

"b. Relevant speeds (V_{EF}, V_{MC}, V_1, V_R, and V_2) used for reduced thrust takeoffs are not less than those that will comply with the required airworthiness controllability criteria when using the takeoff thrust (or derated takeoff thrust, if such is the performance basis) for the ambient conditions, including the effects of an Automatic Power Reserve (APR) system."

Remove paragraph 5f(4) ("Are authorized for airplanes equipped with an ATTCS, whether operating or not, provided no performance credit is allowed for the one-engine-inoperative thrust increase.")

AC 25-7A, "Flight Test Guide for Certification of Transport Category Airplanes"

Replace "Automatic Takeoff Thrust Control System (ATTCS)" throughout paragraph 91 with "Automatic Power Reserve (APR)."

Replace paragraph 91(a)(1) with the following:

(1) Beginning in the 1970's, some manufacturers of turbojet airplanes elected to equip their airplanes with engine thrust control systems that automatically increased the thrust on the operating engine(s) when an engine failed. A similar system was later installed on some turbopropeller equipped airplanes.

Replace paragraph 91(a)(2) with the following:

(2) Takeoff performance credit was granted for APR based upon prescribed system functional and reliability requirements, and performance-related restrictions.

Remove paragraph 91(b)(4).

Replace paragraph 91(b)(5) (including (i) and (ii)) with the following:

(4) If the APR system is approved for use during reduced thrust takeoffs, the relevant takeoff speeds must meet the required controllability criteria of part 25 at the thrust level provided by operation of the APR. It must be demonstrated that the airplane has no adverse handling characteristics and the engines(s) must not exhibit adverse operating characteristics or exceed operating limits when the APR resets thrust on the operating engine(s).

(5) Takeoff with APR is not restricted when airplane performance is based on an approved derate thrust rating that has corresponding airplane and engine limitations approved for use under all weight, altitude, and temperature (WAT) conditions.

Advisory Circular

Advisory Circular Joint

Subject: AUTOMATIC PERFORMANCE RESERVE (APR) SYSTEMS	**Date:** 06 March 2002	**AC/ACJ No:** 25.904
	Initiated By:	**Change:** Draft 1

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

1. PURPOSE. This Advisory Circular (AC) *[Advisory Circular Joint (ACJ)]* describes acceptable means, but not the only means, for showing compliance with the requirements of §25.904 and Appendix I of the Federal Aviation Regulations (FAR) *[of the Joint Airworthiness Requirements (JAR)]*.

2. RELATED FAR *[JAR]* PARAGRAPHS.
§ 25.107, 25.121,25.901, 25.904 and 25.1309

3. APPLICABILITY. The requirements of Section 25.904 apply to powerplant installations incorporating an engine power control system that automatically resets the power or thrust on the operating engine(s) when any engine fails.

An APR system is defined as a system that automatically resets thrust or power on the operating engines(s) when any engine fails during a takeoff/take-off or go-around. For the purpose of showing compliance with the requirements of §/JAR 25.904 and appendix I/Appendix I to part 25/JAR-25, the APR system comprises all elements of equipment necessary for the control and performance of each intended function, including the engine control system and all devices, both mechanical and electrical, that sense engine failure, transmit signals, actuate fuel controls or power levers of the operating engines(s) to achieve scheduled thrust or power changes, and furnish cockpit information on system operation.

Appendix I addresses APR for both take-off and for go-around. It is not intended to require that both capabilities be provided. For example, if APR for go-around is not provided, the requirements related specifically to go-around are not applicable.

4. BACKGROUND.
The requirements related to this subject were originally introduced through special conditions for ATTCS, Automatic Takeoff Thrust Control System, which were limited to take off operations. These special conditions were introduced into part 25 as requirements (25.904 and Appendix I) at Amendment 25-62 in 1987. After the development of Amendment 25-62, FADEC controlled engines became the norm for Transport Category airplanes and the APR

systems, when implemented, were integrated into the basic engine control package, not installed as a separate device. These controls offered reliable one-engine-inoperative (OEI) performance reserves and could reliably offer these reserves throughout the flight envelope. These systems were not envisioned at the time of the rule introduction (Amendment 25-62) and hence the rule was amended (Amendment 25-XX) to address these systems.

From the mid-1990's on, the majority of aircraft being certificated with an APR system were being certified with special conditions allowing for the use of APR for go-around. In Amendment 25-62, the FAA had specifically not allowed the use of APR in this scenario as it was deemed less safe, because a flight crew would have to memorize both OEI and all engines operating power sets for go-around. Later systems allowed the use of a common power setting procedure for the OEI and all-engines-operating scenarios, with adequate system reliability to address the different power or thrust for OEI situations (as per take-off). Amendment 25-XX includes requirements applicable to APR systems intended for use during a go-around.

5. SPECIFIC §25.904, Appendix I ASSESSMENT GUIDANCE.

1. Reliability:

FAR 25 Appendix I *[JAR-25 Appendix I]* specifies minimum reliability levels for these automatic systems. Compliance with these reliability levels for the APR system itself, engine failures in combination with an APR system failure and other failure conditions, such as indications, which can arise as a result of introducing an APR system must be shown to meet specific criteria in addition to FAR 25.901(c)/25.1309 *[JAR 25.901(c)/25.1309]*. The reliability assessment must include the applicable flight manual procedures (e.g. pre-flight, approach and/or daily checks), consider the mission length and exposure for potential dormant failures, and clearly define the assumptions used to define the critical time interval.

The term significant loss or reduction in thrust or power was defined in the pre-amble to this rule introduction, amendment 25-62. It states '"Significant loss or reduction in thrust or power" means an engine thrust loss that is more than two percent of the initially set total approved takeoff thrust for the airplane at existing ambient conditions.'

2. Indication:

Means to indicate that the system is available and functioning is traditionally done by dedicated indications of availability. An alternate means of indicating an APR system is armed and available, particularly with a system which is part of the basic engine control may be by indications of faults when the APR system or the engine control is not functioning (failed), has not passed it's built-in-test, or system integrity cannot be validated. System reliability between defined test or inspection intervals must be validated by a safety assessment. It is expected that some indication means exists on applying take-off power, either at take-off or go-around identifying that the system is available (or is not functioning properly). Should APR power be applied, either manually or automatically, this must be clearly identified to the flight crew by a means directly indicating APR power or thrust is being commanded.

APR systems must also provide means to clearly identify to the flight crew that operating limitations, noteably engine rotor speed(s) and gas temperture, will not be exceeded should APR power or thrust be required. This has been accomplished by:

- Defining & indicating 'soft' limits for normal take off which protect the 'hard'/ approved limits for maximum take off / APR thrust or power.
- Determining realtime the engine margins to the maximum approved limits and annunciate when a margin no longer exists (fully deteriorated).

The intent of this paragraph is to preclude latencies and ensure aircraft are not dispatched with beyond fully deteriorated engines.
The means selected must be validated.

Inhibit logic for aircraft with electronic crew annunciation systems should be considered in addressing crew workload scenarios during critical time intervals.

3. Performance credit

Performance credit for APR is limited to 111% of the normal take-off thrust or power set for take-off and go around. This limitation is intended to ensure a safe all-engines-operating takeoff. Without such a limitation, the all-engines-operating level of safety, which is set in the regulations by the one-engine-inoperative performance requirements, could be degraded.

4. Allowable APR Uptrim

Though performance credit is limited to 111% of initial power set, the actual engine power uptrim level may exceed that value. This allows some tolerance for initial power set and control uptrim power setting accuracy. Further it does allow controls to uptrim to maximum take-off power when using reduced power take-off's (ref:AC25-13). Engine and aircraft operating characteristics must be evaluated, as defined under the Thrust or Power Setting paragraphs, for the actual engine power uptrim level.

5. Means to Verify before take-off

The rule states 'The APR system must be designed to: ...(3) Provide a means to verify to the flightcrew before takeoff and before beginning an approach for landing, as applicable, that the APR system is in a condition to operate;'.
a) A means of compliance that has been accepted is that a verification means must be available should the flightcrew desire to check the system, but this check is not necessarily made mandatory. This means can be through a dedicated switch, pulling back one engine's power once the APR system is operative to confirm that APR is activated, or other approved means.
b) Further, the the system must indicate prior to take-off or approach for landing that it is functioning. Proper aircraft functioning with normal indications is an acceptable means, without necessarily requiring a dedicated APR armed indication, contingent upon all failures & significant faults being annunciated through cockpit messages. This should be substantiated by means of a system safety assessment. Confirmation of system health is by means of one or more of the following: cockpit annunciations, scheduled maintenance activities and/or aircraft flight manual checks.

6. Deactivation Means

The rule states that 'a means [must be provided] for the flight crew to deactivate the automatic function, unless it can be shown that such a means is unnecessary for safety.' This requirement is based on systems that may not be completely integrated into the rest of the engine control system, where it may be necessary from a safety standpoint to allow deactivation of this function. The rule recognizes that there may be circumstances where this means is not required or results in a decrease in safety. An example where disabling the automatic function would be unnecessary for safety would be an APR system fully integrated into the basic engine control such that should faults or failures that disable the APR function are equivalent to failures of the basic engine control. Such faults or failures would, however, require annunciation and /or fault accommodation. In certain extremely reliable designs which again must be part of the basic control, adding a dedicated means for deactivation might be shown to be a leading cause for APR failure during flight & /or lead to engine isolation / independence issues (one switch, both engines).

Systems that are not part of the basic engine control logic are required to have an independent dedicated means to deactivate the APR feature.

7. Required Power or Thrust

To maintain the same level of safety as airplanes without an APR system, it must be possible to manually increase or decrease the power or thrust up to the maximum power or thrust approved for the airplane. From a safety standpoint, there are situations other than engine failure where it may be necessary to use the maximum approved takeoff power or thrust (e.g., windshear recovery, terrain avoidance, collision avoidance). Also, in case the APR system fails to automatically reset thrust or power, the flightcrew must be able to manually reset it.

8. Thrust or Power Terminology

- The maximum approved takeoff thrust or power referenced in appendix I is the maximum takeoff thrust or power established for the airplane under part 25/JAR-25. It may not exceed the takeoff thrust rating limits established for the engine under part 33/JAR-33.
- The initial thrust or power that is set for takeoff with the APR system operative is generally referred to as normal takeoff thrust or power.
- The maximum available takeoff thrust or power is the thrust or power that the engine can achieve by the APR system or by manual means in accordance with aircraft flight manual procedures (vs the thrust or power that performance credit is based upon).
- The intended takeoff or go-around thrust or power is that which is anticipated to be achieved with the system working as per design. This value as a minimum is the value that aircraft performance is based upon, though may be greater.

9. Engine Failure Recognition

Engine failure recognition should be readily apparent to the flightcrew through the effect on airplane flight characteristics or aircraft / engine instruments. If it is not, a warning system independent of the APR system must be provided, i.e., the same engine failure indication source cannot be used to drive the APR system.

10. Critical time interval (CTI)

System reliability calculations are predicated on a determination of a "time at risk," i.e., a time period following the last verification that the system was serviceable up to the last point in time where the failure of that system would have a significant detrimental effect on the safety of the aircraft.

For APR systems used on take-off, this time at risk ends shortly after take-off at a point where simultaneous failure of an engine and the APR uptrim would still permit the aircraft to reach 400 ft above the take-off surface at the same point had the APR been functional throughout (see App I25.2(b)). At this point, sufficient time would have elapsed for flightcrew action to reset thrust on the operating engine(s) to maintain the part 25/JAR-25 flight path requirements. For the take-off case, the critical time interval is significant in the system reliability calculations as it forms a relatively high percentage of the total time at risk. This is because most APR system components are verified as serviceable by the crew shortly before commencement of take-off. Hence specific criteria are defined within the rule (see App I25.2(b)(1)).

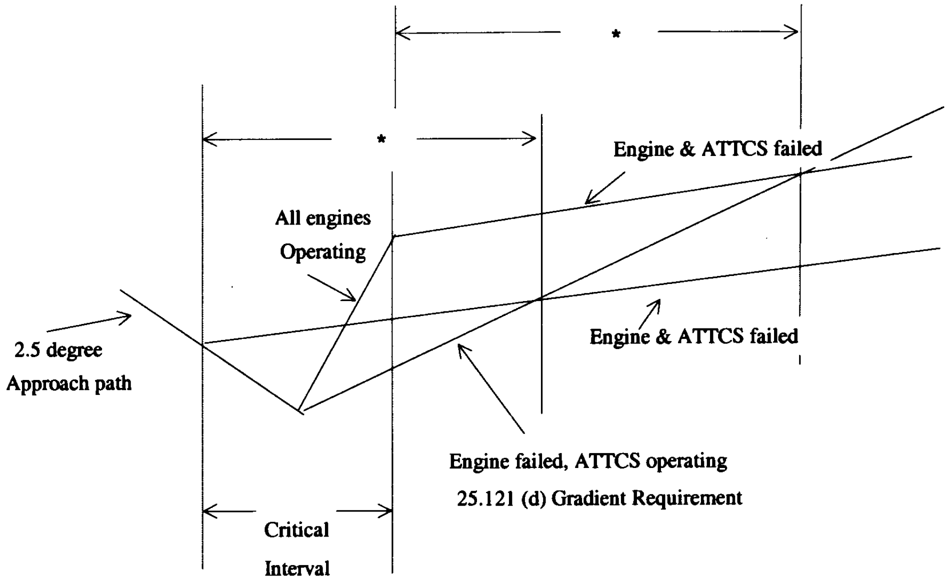
However, in the go-around scenario, the reliability calculations may be dominated by a much longer "time since last verification." For a number of critical components, this is the whole flight duration (typically an hour or more, depending on the aircraft). The few seconds added to this time by a calculated "critical time interval" for go-around at the end of the flight generally has a very minor effect on the overall time at risk and therefore on the calculated APR system reliability. Hence the CTI for go-around has been defined in the rule as a single value of 120 seconds. To cater for system designs where this conservative value would be unduly penalizing, the rule allows a shorter time interval to be used if justified by a rational analysis.

An accepted analysis that has been used on past aircraft certification programs is as follows:

(a) The critical time interval begins at a point on a 2.5 degree approach path from which, assuming a simultaneous engine and APR system failure, the resulting approach climb flight path intersects a flight path, originating at a later point on the same approach path, corresponding to the §/JAR 25.121(d) one-engine-inoperative approach climb gradient. The time interval from the point of simultaneous engine and APR system failure to the intersection of these flight paths must be no shorter than the time interval from V_{EF} to a height of 400 feet above the takeoff/take-off surface during a takeoff/take-off (ref. §/JAR 25.111(c)(4).

(b) The critical time interval ends at the point on an all-engines-operating go-around flight path from which, assuming a simultaneous engine and APR failure, the resulting minimum approach climb flight path intersects a flight path corresponding to the §/JAR 25.121(d) one-engine-inoperative approach climb gradient. The all-engines-operating go-around flight path and the §/JAR 25.121(d) one-engine-inoperative approach climb gradient flight path originate from a common point on a 2.5 degree approach path. The time interval from the point of simultaneous engine and APR system failure to the intersection of these flight paths must be no shorter than the time interval from V_{EF} to a height of 400 feet above the takeoff/take-off surface during a takeoff/take-off (ref. §/JAR 25.111(c)(4).

(c) The critical time interval must be determined at the altitude resulting in the longest critical time interval for which one-engine-inoperative approach climb performance data are presented in the Airplane Flight Manual.



* This time interval must be no shorter than the time interval from V_{EF} to a height of 400 feet during takeoff.

Figure A

airplane certificated to the JAR standards when the initial thrust or power setting is less than 90 percent of the maximum takeoff thrust. The operator of an airplane certificated to the FAR standards may therefore realize a potential revenue loss due to a loss of payload-carrying capability compared to an operator of an airplane certificated to the JAR standards.

2. The JAR requires that inadvertent operation of the automatic system be either of a remote probability or have no more than a minor effect on safety. The FAR does not explicitly address inadvertent operation. The JAR standard is more stringent and requires a more reliable system design.

3. For airplanes equipped with limiters that automatically prevent engine operating limits from being exceeded under existing ambient conditions, a means other than normal use of the power or thrust levers may be used to manually increase power or thrust to the maximum power or thrust. The FAR is more stringent in that it requires that other means to be located on or forward of the thrust or power levers and that it meet the requirements of § 25.177(a), (b), and (c). The JAR only requires the other means to be in an accessible position on or close to the thrust or power levers. This rule difference can lead to differences in the placement of the means used to manually increase thrust or power between airplanes certificated under the different standards. This potential feature is no longer considered required and has been removed. The allowance was introduced to accommodate existing designs at the time the original rule was introduced.

4. The FAR uses the term "Automatic Takeoff Thrust Control System (ATTCS)" for such a system, while the JAA uses the term "Automatic Reserve Performance (ARP) System." This difference is in nomenclature only and does not affect the requirements or stringency of the standards.

5. Another editorial difference is that the FAR combines the performance and system reliability in one section, § I25.3, while the JAR separates these items into two paragraphs, JAR I25.3 and I25.4. As a result, the numbering of the succeeding paragraphs differ between the FAR and the JAR. Various other editorial differences exist as well, but they do not affect the application of the standards.

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?: The proposed action is to harmonize the standards by using the least costly means of ensuring that the underlying safety issue is addressed. Also, the harmonized standard would be updated to include appropriate safety standards for additional capabilities that have been incorporated into more recent system designs for which the current FAR or JAR standards do not contain adequate or appropriate safety standards. In accordance with § 21.16, the FAA has issued special conditions for several airplane types to provide appropriate safety standards for these additional capabilities. These additional capabilities include the use of an engine control system to increase power when an engine fails during or prior to a go-around. The additional standards proposed here are based on those special conditions as well as similar special conditions issued by the JAA.

The changes addressed in this proposal are:

- Use of the term **Automatic Performance Reserve (APR)** as the harmonized name for a system that automatically resets power or thrust on the operating engine(s) when an engine fails during a takeoff or go-around. A majority of airplane and engine manufacturers has been using this term rather than the terms "Automatic Takeoff Thrust Control System (ATTCS)" or "Automatic Reserve Performance (ARP) System" used in the current FAA and JAA standards, respectively. In the proposed harmonized standard, "Automatic Performance Reserve (APR)" would replace "Automatic Takeoff Thrust Control System (ATTCS)" throughout § 25.904 and Appendix I to part 25, and replaces "Automatic Reserve Performance (ARP) System" throughout JAR 25X20(c) and Appendix I to JAR-25. This change would not affect the level of safety intended by the standards.

- **Harmonization of editorial differences.** As an editorial change, the current § I25.3, "Performance and System Reliability Requirements," would be split into two sections: § I25.3 "Performance Requirements," and § I25.4 "Reliability Requirements." The remaining current §§ I25.4 through I25.6 would be renumbered as §§ I25.5 through I25.7. For the most part, the harmonized standard would be based editorially on the current FAR standard. Miscellaneous editorial changes are proposed to improve clarity.

- **Use of APR for go-around.** As noted above, special conditions have been issued for several airplane types (e.g., BAe Systems Jetstream 41, CASA C-295, Dassault Falcon 2000, DeHavilland DHC8-400, Bombardier CRJ 700) to approve the use of an APR system for go-around. Use of such a system for go-around extends engine life and reduces the probability of an engine failure by allowing a lower power or thrust level to be set when conducting a go-around with all engines operating. If an engine fails during the go-around, the APR system will automatically increase power on the operating engine(s) to the go-around power or thrust setting without any action by the pilot. Installation of an APR system for go-around allows the use of the go-around power or thrust setting to be used to show compliance with the one-engine-inoperative approach climb requirements of § 25.121(d) even though a reduced power setting is used for normal operations (i.e., with all engines operating).

  Although APR for go-around is very similar to APR for takeoff, there are three important differences that cause the requirements applicable to takeoff, which are the standards currently included in appendix I, inadequate to address the safety issues associated with a go-around. First, a go-around may be initiated with an engine previously shut down or otherwise made inoperative, in addition to the case where the engine failure occurs during the go-around. Second, the I25.5(b)(3) requirement for a means for the flightcrew to verify before takeoff that the system is in a condition to operate does not ensure adequate reliability or flightcrew awareness regarding the operability of the system. Third, as noted in the preamble to Amendment 25-62 to 14 CFR part 25, which is the amendment that added Appendix I to part 25, flightcrew workload issues precluded expanding the scope of the standards to include phases of flight other than takeoff. The preamble specifically referred to go-around, where it was stated:

> "In regard to ATTCS credit for approach climb and go-around maneuvers, current regulations preclude a higher power for the approach climb (§ 25.121(d)) than for the landing climb (§ 25.119). The workload required for the flightcrew to monitor and select from multiple in-flight power settings in the event of an engine failure during a critical point in the approach, landing, or go-around operations is excessive. Therefore, the FAA does not agree that the scope of the amendment should be changed to include the use of ATTCS for anything except the takeoff phase."

To address these issues, the following changes to appendix I are proposed:

The critical time interval (CTI), during which it must be extremely improbable for the concurrent existence of an engine and APR system failure, would be redefined for the go-around case. The CTI for the go-around case would ensure that it is extremely improbable to violate a flight path based on the §/JAR 25.121(d) one-engine-inoperative approach climb gradient requirement. This critical time interval would take into account that the engine may be inoperative before initiating the go-around, or it may fail during the go-around.

The working group considered various methods for defining the CTI for go-around, including the methods used in the previously mentioned FAA special conditions as well as similar certification requirements for these systems that were established by the JAA and Transport Canada. In examining the different methods and their effects on APR system design, the working group found that a rigorous CTI definition is unnecessary. The CTI, as only one of the criteria used to establish the reliability requirements for the system, is not limiting for current or envisaged future designs. Another reliability criterion contained in the proposed harmonized standard, the consideration of the elapsed time since verification that the system is in a condition to operate, is always more critical than the CTI. For some APR system elements, verification of operability can only be performed prior to commencing the flight, so the elapsed time since verification includes the entire duration of the flight. The short duration of the CTI has a very minor effect on the overall time at risk and therefore on the calculated APR system reliability.

Because the CTI for go-around has little or no effect on the design of the APR system, it could be argued that there is no need to require it to even be considered. However, to retain consistency with the takeoff APR requirements, provide visibility to the issue, and to cover potential future designs for which the CTI could be a critical factor, the working group is not proposing to exclude a CTI value for go-around. Instead, the use of a single, conservative CTI value of 120 seconds is proposed. This value is more stringent than would be obtained through any of the more rigorous methods that have been used, but greatly simplifies the task of showing compliance. For comparison purposes, the CTI for the BAe Systems Jetstream 41 & Bombardier CRJ700 airplanes were determined to be 26 & 35 seconds respectively using the complex method specified in the FAA special conditions.

To address potential designs where the use of such a conservative CTI value would be unduly penalizing, the proposed standard would allow the use of a rational analysis to justify using a shorter time interval. An acceptable method for conducting a rational analysis would be provided in a proposed AC/ACJ (attached), and would be based on the method given in the FAA special conditions. Also, it should be pointed out in the preamble to the proposed regulatory amendment that since the basis of the proposed CTI value is that 120 seconds is conservative and not limiting, if it turns out that this value is not conservative and the rationally derived CTI would be limiting, then a rationally derived CTI must be used.

(1) This definition of the critical time interval for go-around would be added as a new §/JAR I25.2(b)(2). The current §/JAR 25.5(b) would be reformatted such that the definition of the critical time interval for takeoff would become §/JAR I25.2(b)(1).

(2) To address the issue of the verification of system operability, a new §/JAR I25.4(d) would be added to require the safety analysis to include consideration, as applicable, of an APR system failure occurring after the time at which the flight crew last verifies that the APR system is in a condition to operate until the end of the critical time interval.

(3) To address the crew workload issues, a new §/JAR 25.5(b) would be added to require, for approval of an APR system for go-around, the same thrust or power setting procedure to be used for go-around initiated with either all engines operating or with one engine inoperative. This requirement is intended to ensure the same flightcrew action is used to set go-around power or thrust regardless of whether or not an engine is inoperative. As stated in the preamble to Amendment 25-62, the flightcrew cannot be expected to select, set, and monitor from multiple power settings in the event of an engine failure during a critical point in the approach, landing, or go-around.

In addition to the change noted above, the following rule sections (as renumbered under the proposal to reformat the FAR to harmonize with the JAR) would be amended to reference go-around in order to make the requirements applicable to go-around if that capability is sought by the applicant: § 25.904 (JAR 25X20(c) would be removed), §/JAR I25.1(a), §/JAR 25.2(a), §/JAR 25.3(a), §/JAR 25.3(b), §/JAR I25.5(a), I25.5(b), §/JAR 25.6(b)(1), §/JAR 25.6(b)(2), and §/JAR 25.7(b).

- **Thrust or power setting**. The proposed harmonized standard would replace the FAR limitation that the initial thrust or power setting must not be less than 90 percent of the thrust or power set by the APR system after an engine failure with the JAR requirement that the thrust used to show compliance with the applicable one-engine-inoperative climb requirements not be greater than 111 percent of the thrust obtained at the initial thrust or power setting. Both standards are intended to ensure an adequate climb capability with all engines operating and to limit the degradation of performance if the critical engine fails and the APR system fails to apply maximum takeoff thrust or power on the operating engine(s).

  The FAR limitation was also driven by pilot workload concerns, similar to the workload concerns with extending APR capability to cover the go-around phase of flight. The preamble to Amendment 25-62 states:

  > "The FAA has not restricted ATTCS operations where airplane performance is based on an approved "derate" rating which has corresponding engine and airplane limits approved for use under all weight, altitude, and temperature (WAT) conditions. However, the FAA has not allowed the reduced thrust (assumed temperature or weight decrement method) operations to be combined with ATTCS because the resulting flight procedures would increase the pilot workload by creating an infinite number of initial all-engine and engine-failed thrust settings. The increased workload could lead to performance computation error, and create confusion for the crews' workload during a critical high workload engine failure situation. Operationally, noise abatement procedures have already created another set of thrust settings which must be monitored and set. The combination would substantially increase exposure to performance limiting condition, and this clearly would not be equivalent to current regulations, which are based on a single thrust setting for takeoff."

  Since the time that was written, the FAA has allowed reduced thrust operations with the APR system operating, but has not allowed the thrust or power increase provided by the APR system after an engine failure to be used to show compliance with the airplane performance requirements. The proposed harmonized standard would allow performance credit for a thrust or power increase limited to 111 percent of the initial thrust or power set at the beginning of the takeoff or go-around. A thrust or power increase of 111 percent is equivalent to the increase achieved in going from an initial setting of 90 percent to 100 percent of the thrust or power set by the APR system after an engine failure.

The pilot workload issue would be the same for an initial thrust or power setting of 89 percent of the maximum takeoff thrust or power as it would for an initial thrust or power setting of 90 percent. During the critical time interval it must be extremely improbable for a combined engine and APR system failure. This requirement provides sufficient time for the flightcrew to determine if additional thrust or power is needed in the event of a combined engine and APR system failure. Current § I25.5(b)(2), which would be redesignated § I25.6(b)(1) already requires that the system allow manual increase or decrease of the thrust or power up to the maximum takeoff thrust or power. There is no need for the flightcrew to determine and set the specific one-engine-inoperative thrust or power setting that would normally be set by a functioning APR system as long as the appropriate thrust or power setting limits are displayed on the relevant cockpit instrument displays.

- **Inadvertent operation**. The proposed harmonized standard would include the additional JAA requirement regarding the potential for: inadvertent operation. The current JAR I25.4(c) would be adopted as harmonized §/JAR I25.4(c).

- **Means to deactivate**. In recognition that modern FADEC controls have the APR system as an integral part of the control and hence abnormalities or apparent inadvertent operation indicates a basic control function fault or failure, a dedicated means to deactivate the APR system may not be required. Reducing power or thrust to idle or shutting down the engine may be the appropriate action. In the proposed harmonized standard, current § I25.5(b)(4) would be revised to indicate that a means to deactivate the automatic function need not be provided if it can be shown that such a means is unnecessary for safety. Typically, this would involve substantiation the APR system without a switch can comply with §§/JAR 25.1301 and 25.1309 and that a deactivation means will never be needed in order to maintain the same level of safety as would be present if a switch were available.

<u>What should the harmonized standard be?</u>: See below

<u>Proposed text of harmonized standard:</u> See Appendix 1.

<u>How does this proposed standard address the underlying safety issue?:</u> It continues to ensure that incorporation of such a system provides a level of safety intended by the basic Part 25 requirements, adopting the appropriate existing FAR/JAR standards and adding safety standards from applicable special conditions) issued for capabilities added since the standards were adopted.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: The proposed standard maintains the level of safety by incorporating existing accepted regulatory requirements and adds the JAR requirement relative to inadvertent operation of the system.

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, including any applicable special conditions.

What other options have been considered and why were they not selected?: The harmonization of the most stringent of the FAR / JAR material was considered for the 'fast track' process. This option was not pursued because it did not address the additional capability of APR for go-around. The majority of recently certificated aircraft with an APR system provide this capability and have required special conditions for airworthiness approval.

The group also considered addressing APR credit beyond the take-off / go-around power set regime (e.g., Climb power to Maximum Continuous power).
The group decided that this change could not be made within the schedule defined for the Fast Track Harmonization Program.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes and manufacturers of the engines and engine power control systems for those airplanes that automatically reset thrust or power on the operating engine(s) in the event of the failure of an engine 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 advisory material in Advisory Circulars 25-13 and 25-7A would need to be revised to reflect the changes in the standards. The proposed revisions are included as Appendix 2 to this report. An AC to assist in the interpretation of the criteria contained within the proposed rule, particularly a rational analysis method to define the CTI for go-around, would be beneficial but not a condition to publishing the new / revised standard.

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, FTHWG.

What is the cost impact of complying with the proposed standard?:
The proposed standards offer more flexibility and reflect currently accepted practice in compliance with the current standards as augmented by the issuance of special conditions. There should be a reduction in certification cost.

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. However, due to the change in categorization of this project from category 1 (envelope) to category 3 (harmonize), additional time is needed to complete this task and coordinate a recommendation from the Power Plant Installation and Flight Test Harmonization Working Groups.

APPENDIX 1 Proposed Rule Change

§/JAR 25.904 : **Automatic performance reserve (APR) system.**
Each applicant seeking approval for an airplane equipped with an engine control system that automatically increases the power or thrust on the operating engine(s) either when an engine fails during a takeoff/take-off or during a go-around when an engine becomes inoperative either before or after the go-around is initiated must comply with the additional requirements of Appendix I of this part.

§/JAR 25 Appendix I: **Automatic Performance Reserve (APR) System**

I 25.1 *General.*

(a) This Appendix specifies additional requirements for airplanes/aeroplanes equipped with an engine control system that automatically increases thrust or power on the operating engine(s) either when an engine fails during a takeoff/take-off or during a go-around when an engine becomes inoperative either before or after the go-around is initiated, or both.

(b) With the APR system and associated systems functioning normally as designed, all applicable requirements of part 25/JAR-25, except as provided in this Appendix, must be met without requiring any action by the crew to increase thrust or power.

I 25.2 *Definitions.*

(a) Automatic Performance Reserve (APR) System. An APR system is defined as a system that automatically increases thrust or power on the operating engines(s) either when an engine fails during a takeoff/take-off or during a go-around when an engine becomes inoperative either before or after the go-around is initiated. For the purpose of showing compliance with the requirements in this appendix/Appendix, the APR system comprises all elements of equipment necessary for the control and performance of each intended function, including the engine control system and all devices, both mechanical and electrical, that sense engine failure, transmit signals, actuate fuel controls or power levers of the operating engines(s) to achieve scheduled thrust or power changes, and furnish cockpit information on system operation.

(b) Critical Time Interval. The critical time interval for an APR system that automatically increases thrust or power on the operating engine(s) after an engine fails is defined as follows:

(1) For takeoff, the critical time interval is between one second before reaching V_1, and the point on the takeoff/take-off flight path with all engines operating where, assuming a simultaneous engine and APR system failure, the resulting flight path thereafter intersects the flight path determined in accordance with §/JAR 25.115,

at not less than 400 feet above the takeoff/take-off surface. This time interval is shown in Figure 1.

(2) For go-around, the critical time interval is defined as 120 seconds. A shorter time interval may be used if justified by a rational analysis.

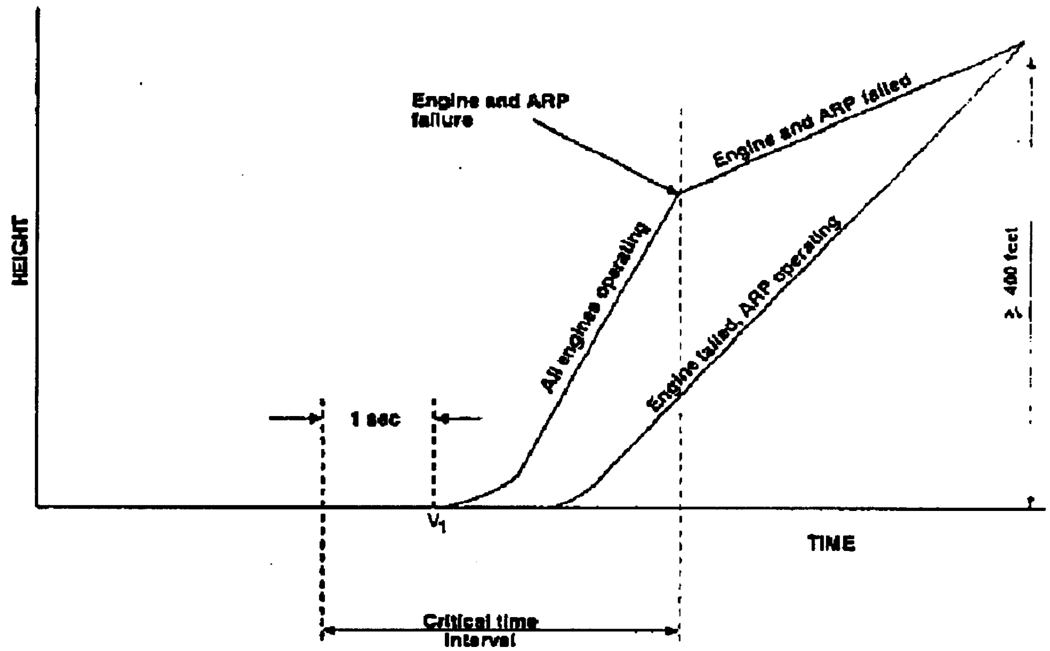


Figure A

I 25.3 *Performance Requirements.*

(a) All applicable performance requirements of part 25/JAR-25 must be met after failure of the critical engine at the most critical point during a takeoff or go-around, as applicable, with the APR system functioning.

(b) The propulsive thrust obtained from each operating engine after failure of the critical engine during take-off, or during a go-around, as applicable, used to show compliance with the one-engine-inoperative climb requirements of §/JAR 25.121(a), (b), and (d), as applicable, may not be greater than the lesser of–

(1) The actual propulsive thrust resulting from the initial setting of power or thrust controls with the APR system functioning; or

(2) 111 percent of the propulsive thrust resulting from the initial setting of power or thrust controls with the APR system failing to reset thrust or power and without any action by the crew to reset thrust or power.

I 25.4 *Reliability Requirements.*

(a) An APR system failure or a combination of failures in the APR system during the critical time interval:
  (1) That prevents the automatic insertion of the intended takeoff or go-around thrust or power, as applicable, must be improbable.
  (2) That results in a significant loss or reduction in thrust or power must be improbable.
(b) The concurrent existence of theAPR system failures regulated in section (a) above and an engine failure during the critical time interval must be extremely improbable.
(c) The inadvertent operation of the APR system must be remote or to have no more than a minor effect.
(d) The safety analysis must include consideration, as applicable, of an APR system failure occurring after the time at which the flight crew last verifies that the APR system is in a condition to operate until the end of the critical time interval.

I 25.5 *Thrust or Power Setting.*

(a) The initial thrust or power setting on each engine at the beginning of the takeoff roll or go-around, as applicable, may not be less than either of the following:

  (1) That required to permit normal operation of all safety-related systems and equipment dependent upon engine thrust or power lever position; or
  (2) That shown to comply with the applicable airplane controllability and engine operating characteristics requirements if thrust or power is increased from the initial takeoff thrust or power to the maximum available takeoff thrust or power at any point in the takeoff, or the initial thrust or power used for go-around to the maximum available go-around thrust or power at any point in the go-around, as applicable.

(b) For approval of an APR system for go-around, the thrust or power setting procedure must be the same for go-arounds initiated with all engines operating as for go-arounds initiated with one engine inoperative.

I 25.6 *Powerplant Controls.*

APPENDIX 1 Proposed Rule Change

(a) In addition to the requirements of §/JAR 25.1141, no single failure or malfunction, or probable combination thereof, of the APR system, including associated systems, may cause the failure of any powerplant function necessary for safety.

(b) The APR system must be designed to:

(1) Permit manual decrease or increase in thrust or power up to the maximum available takeoff/go-around thrust or power through the use of the normal thrust or power levers.;

(2) Provide a means to verify to the flightcrew before takeoff and before beginning an approach for landing, as applicable, that the APR system is in a condition to operate; and

(3) Provide a means for the flightcrew to deactivate the automatic function, unless it can be shown that such a means is unnecessary for safety. This means must be designed to prevent inadvertent deactivation.

I 25.7 *Powerplant Instruments*

In addition to the requirements of §/JAR 25.1305:

(a) A means must be provided to indicate when the APR system is in the armed or ready condition; and

(b) If the inherent flight characteristics of the airplane do not provide adequate warning that an engine has failed, a warning system that is independent of the APR system must be provided to give the pilot a clear warning of an engine failure during the takeoff or go-around, as applicable.

(c) Engine indications must provide sufficient information during the takeoff or go-around, as applicable, to show whether or not the engine is capable of achieving the maximum available thrust or power without exceeding engine limits.

APPENDIX 3 Current FAR Text

25.904 Automatic Takeoff Thrust Control System

Each applicant seeking approval for installation of an engine power control system that automatically resets the power or thrust on the operating engine(s) when any engine fails during the takeoff must comply with the requirements of Appendix I of this part.

APPENDIX I

I 25.1 *General*

(a) This appendix specifies additional requirements for installation of an engine power control system that automatically resets thrust or power on operating engine(s) in the event of any one engine failure during takeoff.

(b) With the ATTCS and associated systems functioning normally as designed, all applicable requirements of Part 25, except as provided in this appendix, must be met without requiring any action by the crew to increase thrust or power.

I 25.2 *Definitions*

(a) *Automatic Takeoff Thrust Control System (ATTCS).* An ATTCS is defined as the entire automatic system used on takeoff, including all devices, both mechanical and electrical, that sense engine failure, transmit signals, actuate fuel controls or power levers or increase engine power by other means on operating engines to achieve scheduled thrust or power increases, and furnish cockpit information on system operation.

(b) *Critical Time Interval.* When conducting an ATTCS takeoff, the critical time interval is between V_1 minus 1 second and a point on the minimum performance, all-engine flight path where, assuming a simultaneous occurrence of an engine and ATTCS failure, the resulting minimum flight path thereafter intersects the Part 25 required actual flight path at no less than 400 feet above the takeoff surface. This time interval is shown in the following illustration:

[Illustration]

I 25.3 *Performance and System Reliability Requirements*

The applicant must comply with the performance and ATTCS reliability requirements as follows:

(a) An ATTCS failure or a combination of failures in the ATTCS during the critical time interval:

(1) Shall not prevent the insertion of the *maximum approved takeoff* thrust or power, or must be shown to be an improbable event.

APPENDIX 3 Current FAR Text

(2) Shall not result in a significant loss or reduction in thrust or power, or must be shown to be an extremely improbable event.

(b) The concurrent existence of an ATTCS failure and an engine failure during the critical time interval must be shown to be extremely improbable.

(c) All applicable performance requirements of Part 25 must be met with an engine failure occurring at the most critical point during takeoff with the ATTCS system functioning.

I 25.4 *Thrust Setting*

The initial takeoff thrust or power setting on each engine at the beginning of the takeoff roll may not be less than any of the following:

(a) Ninety (90) percent of the thrust or power set by the ATTCS (the maximum takeoff thrust or power approved for the airplane under existing ambient conditions);

(b) That required to permit normal operation of all safety-related systems and equipment dependent upon engine thrust or power lever position; or

(c) That shown to be free of hazardous engine response characteristics when thrust or power is advanced from the initial takeoff thrust or power to the maximum approved takeoff thrust or power.

I 25.5 *Powerplant Controls*

(a) In addition to the requirements of § 25.1141, no single failure or malfunction, or probable combination thereof, of the ATTCS, including associated systems, may cause the failure of any powerplant function necessary for safety.

(b) The ATTCS must be designed to:

(1) Apply thrust or power on the operating engine(s), following any one engine failure during takeoff, to achieve the maximum approved takeoff thrust or power without exceeding engine operating limits;

(2) Permit manual decrease or increase in thrust or power up to the maximum takeoff thrust or power approved for the airplane under existing conditions through the use of the power lever. For airplanes equipped with limiters that automatically prevent engine operating limits from being exceeded under existing ambient conditions, other means may be used to increase the thrust or power in the event of an ATTCS failure provided the means is located on or forward of the power levers; is easily identified and operated under all operating conditions by a single action of either pilot with the hand that is normally used to actuate the power levers; and meets the requirements of § 25.777(a), (b), and (c);

(3) Provide a means to verify to the flightcrew before takeoff that the ATTCS is in a condition to operate; and

(4) Provide a means for the flightcrew to deactivate the automatic function. This means must be designed to prevent inadvertent deactivation.

I 25.6 *Powerplant Instruments*

APPENDIX 3 Current FAR Text

In addition to the requirements of § 25.1305:

(a) A means must be provided to indicate when the ATTCS is in the armed or ready condition; and

(b) If the inherent flight characteristics of the airplane do not provide adequate warning that an engine has failed, a warning system that is independent of the ATTCS must be provided to give the pilot a clear warning of any engine failure during takeoff.

APPENDIX 4 Current JAR Text

25X20 Applicability
(c) If the aeroplane is equipped with an engine control system that automatically resets the power or thrust on the operating engine(s) when any engine fails during take-off, additional requirements pertaining to aeroplane performance and limitations and the functioning and reliability of the system , contained in Appendix I, must be complied with.

APPENDIX I

I 25.1 General

(a) This Appendix specifies additional requirements and limitations for aeroplanes equipped with an engine_control system that automatically resets thrust or power on operating engine(s) when any engine fails during take-off, and for which performance credit is limited to that of paragraph 25.3(b) of this Appendix. When performance credit is not so limited, Special Conditions will apply .
(b) With the ARP system and associated systems functioning normally as designed, all applicable requirements of JAR-25, except as provided in this Appendix, must be met without requiring any action by the crew to increase thrust or power.

I 25.2 Definitions

(a) *Automatic Reserve Performance (ARP) System.* An ARP system is defined as a system which automatically resets thrust or power on the operating engines(s) when any engine fails during take-off. For the purpose of the requirements in this Appendix, the ARP system comprises all elements of equipment necessary for the control and performance of each intended function, including all devices, both mechanical and electrical, that sense engine failure, transmit signals and actuate fuel controls or power levers of the operating engines(s) to achieve scheduled thrust or power increases, the engine control system and devices which furnish cockpit information on system operation.
(b) *Critical Time Interval.* When conducting an ARP takeoff, the critical time interval is between one second before reaching V_1, and the point on the gross take-off flight path with all engines operating where, assuming a simultaneous_engine and ARP system failure, the resulting_flight path thereafter intersects the gross flight path, determined in accordance with JAR 25.115, at not less than 400 feet above the take-off surface. This definition is shown in the following figure:

[Illustration]

I 25.3 Performance_requirements

All applicable performance requirements of JAR-25 must be met with the ARP system functioning normally as designed, except that the propulsive thrust obtained from each operating engine after failure of the critical engine during take-off, and the thrust at which compliance with the one-engine-inoperative climb requirements in JAR 25.121(a) and (b) is shown, must be assumed to be not greater than the lesser of–

(a) The actual propulsive thrust resulting from the initial setting of power or thrust controls with the ARP system functioning normally as designed, without requiring any action by the crew to increase thrust or power until the aeroplane has achieved a height of 400 feet above the take-off surface; or

(b) 111 percent of the propulsive thrust which would have been available at the initial setting of power or thrust controls in the event of failure of the ARP system to reset thrust power, without any action by the crew to increased thrust or power until the aeroplane has achieved a height of 400 feet above the take-off surface.

Note 1. The limitation of performance credit for ARP system operation to 111 percent of the thrust provided at the initial setting is intended to—

(i) Assure an adequate level of climb performance with all engines operating at the initial setting of power or thrust controls, and

(ii) Limit the degradation of performance in the event of a critical engine failure combined with failure of the ARP system to operate as designed

Note 2. For propeller-driven aeroplanes, propulsive thrust means the total effective propulsive force obtained from an operating engine and its propeller.

I 25.4 Reliability requirements

(See JAR 25.1309 and AMJ 25.1309)

(a) The occurrence of an ARP system failure or a combination of failures in the ARP system during the critical time interval which—

(1) Prevents the insertion of the required thrust or power, must be shown to be Improbable;

(2) Results in a significant loss or reduction in thrust or power, must be shown to be Extremely Improbable.

(a) The concurrent existence of an ARP system failure and an engine failure during the critical time interval must be shown to be Extremely Improbable.

(b) The inadvertent operation of the ARP system must be shown either to be Remote or to have no more than a minor effect.

I 25.5 Thrust or power setting

The initial setting of takeoff thrust or power controls on each engine at the beginning of the take-off roll may not be less than the lesser of:

(a) That required to permit normal operation of all safety-related systems and equipment dependent upon engine thrust or power lever position; or

(b) That shown to be free of hazardous engine response characteristics when thrust or power is increased from the initial take-off thrust or power level to the maximum approved take-off thrust or power.

APPENDIX 4 Current JAR Text

I 25.6 Powerplant controls

(a) *General*
(1) In addition to the requirements of JAR 25.1141, no single failure or malfunction, or probable combination thereof, of the ARP system, including associated systems, may cause the failure of any powerplant function necessary for safety.
(2) The ARP system must be designed to perform accurately its intended function without exceeding engine operating limits under all reasonably expected conditions.
(b) *Thrust or Power Lever Control.* The ARP system must be designed to permit manual decrease or increase in thrust or power up to the maximum thrust or power approved for use following engine failure during take-off through the use of normal thrust or power controls, except that for aeroplanes equipped with limiters that automatically prevent engine operating limits from being exceeded, other means may be used to increase thrust or power provided that the means is located in an accessible position on or close to the thrust or power levers; is easily identified and operated under all operating conditions by a single action of either pilot with the hand that is normally used to actuate the power levers.
(c) *System Control and Monitoring.* The ARP system must be designed to provide
(1) A means for checking prior to take-off that the system is in an operable condition; and
(2) A means for the flight crew to deactivate the automatic function. This means must be designed to prevent inadvertent de-activation.

I 25.7 Powerplant Instruments

(a) *System Control and Monitoring.* A means must be provided to indicate when the ARP system is in the armed or ready condition.
(b) *Engine Failure Warning.* If the inherent flight characteristics of the aeroplane do no provide adequate warning that an engine has failed, a warning system which is independent of the ARP system must be provided to give the pilot a clear warning of any engine failure during take-off.

APPENDIX 2 Proposed Existing Advisory Material Change

AC 25-13, "Reduced and Derated Takeoff Thrust (Power) Procedures"

Replace paragraph 5b with the following:

"b. Relevant speeds (V_{EF}, V_{MC}, V_1, V_R, and V_2) used for reduced thrust takeoffs are not less than those that will comply with the required airworthiness controllability criteria when using the takeoff thrust (or derated takeoff thrust, if such is the performance basis) for the ambient conditions, including the effects of an Automatic Power Reserve (APR) system."

Remove paragraph 5f(4) ("Are authorized for airplanes equipped with an ATTCS, whether operating or not, provided no performance credit is allowed for the one-engine-inoperative thrust increase.")

AC 25-7A, "Flight Test Guide for Certification of Transport Category Airplanes"

Replace "Automatic Takeoff Thrust Control System (ATTCS)" throughout paragraph 91 with "Automatic Power Reserve (APR)."

Replace paragraph 91(a)(1) with the following:

(1) Beginning in the 1970's, some manufacturers of turbojet airplanes elected to equip their airplanes with engine thrust control systems that automatically increased the thrust on the operating engine(s) when an engine failed. A similar system was later installed on some turbopropeller equipped airplanes.

Replace paragraph 91(a)(2) with the following:

(2) Takeoff performance credit was granted for APR based upon prescribed system functional and reliability requirements, and performance-related restrictions.

Remove paragraph 91(b)(4).

Replace paragraph 91(b)(5) (including (i) and (ii)) with the following:

(4) If the APR system is approved for use during reduced thrust takeoffs, the relevant takeoff speeds must meet the required controllability criteria of part 25 at the thrust level provided by operation of the APR. It must be demonstrated that the airplane has no adverse handling characteristics and the engines(s) must not exhibit adverse operating characteristics or exceed operating limits when the APR resets thrust on the operating engine(s).

(5) Takeoff with APR is not restricted when airplane performance is based on an approved derate thrust rating that has corresponding airplane and engine limitations approved for use under all weight, altitude, and temperature (WAT) conditions.

Advisory Circular

Advisory Circular Joint

Subject: AUTOMATIC PERFORMANCE RESERVE (APR) SYSTEMS

Date: 06 March 2002

AC/ACJ No: 25.904

Initiated By:

Change: Draft 1

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

1. PURPOSE. This Advisory Circular (AC) *[Advisory Circular Joint (ACJ)]* describes acceptable means, but not the only means, for showing compliance with the requirements of §25.904 and Appendix I of the Federal Aviation Regulations (FAR) *[of the Joint Airworthiness Requirements (JAR)]*.

2. RELATED FAR *[JAR]* PARAGRAPHS.
§ 25.107, 25.121,25.901, 25.904 and 25.1309

3. APPLICABILITY. The requirements of Section 25.904 apply to powerplant installations incorporating an engine power control system that automatically resets the power or thrust on the operating engine(s) when any engine fails.

An APR system is defined as a system that automatically resets thrust or power on the operating engines(s) when any engine fails during a takeoff/take-off or go-around. For the purpose of showing compliance with the requirements of §/JAR 25.904 and appendix I/Appendix I to part 25/JAR-25, the APR system comprises all elements of equipment necessary for the control and performance of each intended function, including the engine control system and all devices, both mechanical and electrical, that sense engine failure, transmit signals, actuate fuel controls or power levers of the operating engines(s) to achieve scheduled thrust or power changes, and furnish cockpit information on system operation.

Appendix I addresses APR for both take-off and for go-around. It is not intended to require that both capabilities be provided. For example, if APR for go-around is not provided, the requirements related specifically to go-around are not applicable.

4. BACKGROUND.
The requirements related to this subject were originally introduced through special conditions for ATTCS, Automatic Takeoff Thrust Control System, which were limited to take off operations. These special conditions were introduced into part 25 as requirements (25.904 and Appendix I) at Amendment 25-62 in 1987. After the development of Amendment 25-62, FADEC controlled engines became the norm for Transport Category airplanes and the APR

systems, when implemented, were integrated into the basic engine control package, not installed as a separate device. These controls offered reliable one-engine-inoperative (OEI) performance reserves and could reliably offer these reserves throughout the flight envelope. These systems were not envisioned at the time of the rule introduction (Amendment 25-62) and hence the rule was amended (Amendment 25-XX) to address these systems.

From the mid-1990's on, the majority of aircraft being certificated with an APR system were being certified with special conditions allowing for the use of APR for go-around. In Amendment 25-62, the FAA had specifically not allowed the use of APR in this scenario as it was deemed less safe, because a flight crew would have to memorize both OEI and all engines operating power sets for go-around. Later systems allowed the use of a common power setting procedure for the OEI and all-engines-operating scenarios, with adequate system reliability to address the different power or thrust for OEI situations (as per take-off). Amendment 25-XX includes requirements applicable to APR systems intended for use during a go-around.

5. <u>SPECIFIC §25.904, Appendix I ASSESSMENT GUIDANCE.</u>

1. Reliability:

FAR 25 Appendix I *[JAR-25 Appendix I]* specifies minimum reliability levels for these automatic systems. Compliance with these reliability levels for the APR system itself, engine failures in combination with an APR system failure and other failure conditions, such as indications, which can arise as a result of introducing an APR system must be shown to meet specific criteria <u>in addition to FAR 25.901(c)/25.1309</u> *[JAR 25.901(c)/25.1309]*. The reliability assessment must include the applicable flight manual procedures (e.g. pre-flight, approach and/or daily checks), consider the mission length and exposure for potential dormant failures, and clearly define the assumptions used to define the critical time interval.

The term significant loss or reduction in thrust or power was defined in the pre-amble to this rule introduction, amendment 25-62. It states '"Significant loss or reduction in thrust or power" means an engine thrust loss that is more than two percent of the initially set total approved takeoff thrust for the airplane at existing ambient conditions.'

2. Indication:

Means to indicate that the system is available and functioning is traditionally done by dedicated indications of availability. An alternate means of indicating an APR system is armed and available, particularly with a system which is part of the basic engine control may be by indications of faults when the APR system or the engine control is not functioning (failed), has not passed it's built-in-test, or system integrity cannot be validated. System reliability between defined test or inspection intervals must be validated by a safety assessment. It is expected that some indication means exists on applying take-off power, either at take-off or go-around identifying that the system is available (or is not functioning properly). Should APR power be applied, either manually or automatically, this must be clearly identified to the flight crew by a means directly indicating APR power or thrust is being commanded.

APR systems must also provide means to clearly identify to the flight crew that operating limitations, noteably engine rotor speed(s) and gas temperture, will not be exceeded should APR power or thrust be required. This has been accomplished by:

- Defining & indicating 'soft' limits for normal take off which protect the 'hard'/ approved limits for maximum take off / APR thrust or power.
- Determining realtime the engine margins to the maximum approved limits and annunciate when a margin no longer exists (fully deteriorated).

The intent of this paragraph is to preclude latencies and ensure aircraft are not dispatched with beyond fully deteriorated engines.
The means selected must be validated.

Inhibit logic for aircraft with electronic crew annunciation systems should be considered in addressing crew workload scenarios during critical time intervals.

3. Performance credit

Performance credit for APR is limited to 111% of the normal take-off thrust or power set for take-off and go around. This limitation is intended to ensure a safe all-engines-operating takeoff. Without such a limitation, the all-engines-operating level of safety, which is set in the regulations by the one-engine-inoperative performance requirements, could be degraded.

4. Allowable APR Uptrim

Though performance credit is limited to 111% of initial power set, the actual engine power uptrim level may exceed that value. This allows some tolerance for initial power set and control uptrim power setting accuracy. Further it does allow controls to uptrim to maximum take-off power when using reduced power take-off's (ref:AC25-13). Engine and aircraft operating characteristics must be evaluated, as defined under the Thrust or Power Setting paragraphs, for the actual engine power uptrim level.

5. Means to Verify before take-off

The rule states 'The APR system must be designed to: ...(3) Provide a means to verify to the flightcrew before takeoff and before beginning an approach for landing, as applicable, that the APR system is in a condition to operate;'.
a) A means of compliance that has been accepted is that a verification means must be available should the flightcrew desire to check the system, but this check is not necessarily made mandatory. This means can be through a dedicated switch, pulling back one engine's power once the APR system is operative to confirm that APR is activated, or other approved means.
b) Further, the the system must indicate prior to take-off or approach for landing that it is functioning. Proper aircraft functioning with normal indications is an acceptable means, without necessarily requiring a dedicated APR armed indication, contingent upon all failures & significant faults being annunciated through cockpit messages. This should be substantiated by means of a system safety assessment. Confirmation of system health is by means of one or more of the following: cockpit annunciations, scheduled maintenance activities and/or aircraft flight manual checks.

6. Deactivation Means

The rule states that 'a means [must be provided] for the flight crew to deactivate the automatic function, unless it can be shown that such a means is unnecessary for safety.' This requirement is based on systems that may not be completely integrated into the rest of the engine control system, where it may be necessary from a safety standpoint to allow deactivation of this function. The rule recognizes that there may be circumstances where this means is not required or results in a decrease in safety. An example where disabling the automatic function would be unnecessary for safety would be an APR system fully integrated into the basic engine control such that should faults or failures that disable the APR function are equivalent to failures of the basic engine control. Such faults or failures would, however, require annunciation and /or fault accommodation. In certain extremely reliable designs which again must be part of the basic control, adding a dedicated means for deactivation might be shown to be a leading cause for APR failure during flight & /or lead to engine isolation / independence issues (one switch, both engines).

Systems that are not part of the basic engine control logic are required to have an independent dedicated means to deactivate the APR feature.

7. Required Power or Thrust

To maintain the same level of safety as airplanes without an APR system, it must be possible to manually increase or decrease the power or thrust up to the maximum power or thrust approved for the airplane. From a safety standpoint, there are situations other than engine failure where it may be necessary to use the maximum approved takeoff power or thrust (e.g., windshear recovery, terrain avoidance, collision avoidance). Also, in case the APR system fails to automatically reset thrust or power, the flightcrew must be able to manually reset it.

8. Thrust or Power Terminology

- The maximum approved takeoff thrust or power referenced in appendix I is the maximum takeoff thrust or power established for the airplane under part 25/JAR-25. It may not exceed the takeoff thrust rating limits established for the engine under part 33/JAR-33.
- The initial thrust or power that is set for takeoff with the APR system operative is generally referred to as normal takeoff thrust or power.
- The maximum available takeoff thrust or power is the thrust or power that the engine can achieve by the APR system or by manual means in accordance with aircraft flight manual procedures (vs the thrust or power that performance credit is based upon).
- The intended takeoff or go-around thrust or power is that which is anticipated to be achieved with the system working as per design. This value as a minimum is the value that aircraft performance is based upon, though may be greater.

9. Engine Failure Recognition

Engine failure recognition should be readily apparent to the flightcrew through the effect on airplane flight characteristics or aircraft / engine instruments. If it is not, a warning system independent of the APR system must be provided, i.e., the same engine failure indication source cannot be used to drive the APR system.

10. Critical time interval (CTI)

System reliability calculations are predicated on a determination of a "time at risk," i.e., a time period following the last verification that the system was serviceable up to the last point in time where the failure of that system would have a significant detrimental effect on the safety of the aircraft.

For APR systems used on take-off, this time at risk ends shortly after take-off at a point where simultaneous failure of an engine and the APR uptrim would still permit the aircraft to reach 400 ft above the take-off surface at the same point had the APR been functional throughout (see App I25.2(b)). At this point, sufficient time would have elapsed for flightcrew action to reset thrust on the operating engine(s) to maintain the part 25/JAR-25 flight path requirements. For the take-off case, the critical time interval is significant in the system reliability calculations as it forms a relatively high percentage of the total time at risk. This is because most APR system components are verified as serviceable by the crew shortly before commencement of take-off. Hence specific criteria are defined within the rule (see App I25.2(b)(1)).

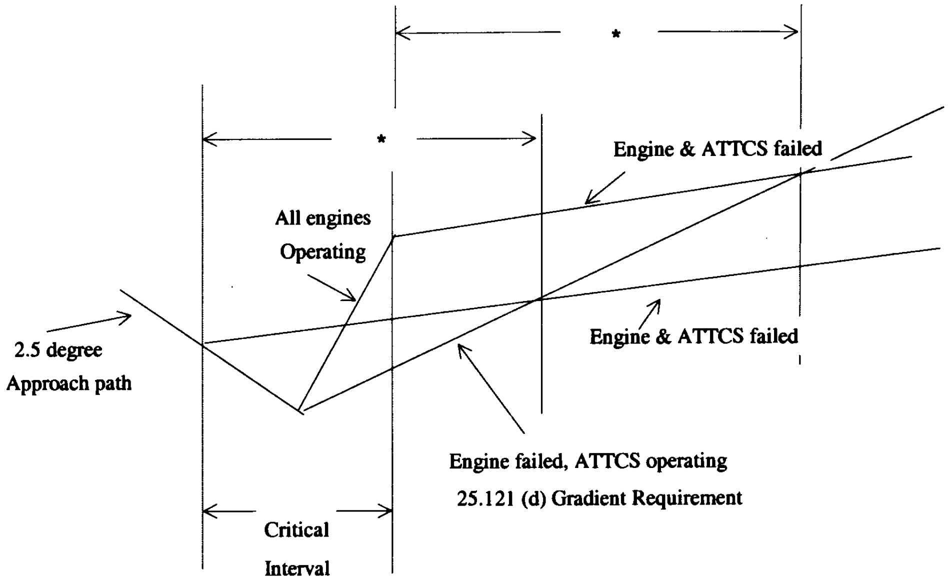
However, in the go-around scenario, the reliability calculations may be dominated by a much longer "time since last verification." For a number of critical components, this is the whole flight duration (typically an hour or more, depending on the aircraft). The few seconds added to this time by a calculated "critical time interval" for go-around at the end of the flight generally has a very minor effect on the overall time at risk and therefore on the calculated APR system reliability. Hence the CTI for go-around has been defined in the rule as a single value of 120 seconds. To cater for system designs where this conservative value would be unduly penalizing, the rule allows a shorter time interval to be used if justified by a rational analysis.

An accepted analysis that has been used on past aircraft certification programs is as follows:

(a) The critical time interval begins at a point on a 2.5 degree approach path from which, assuming a simultaneous engine and APR system failure, the resulting approach climb flight path intersects a flight path, originating at a later point on the same approach path, corresponding to the §/JAR 25.121(d) one-engine-inoperative approach climb gradient. The time interval from the point of simultaneous engine and APR system failure to the intersection of these flight paths must be no shorter than the time interval from V_{EF} to a height of 400 feet above the takeoff/take-off surface during a takeoff/take-off (ref. §/JAR 25.111(c)(4).

(b) The critical time interval ends at the point on an all-engines-operating go-around flight path from which, assuming a simultaneous engine and APR failure, the resulting minimum approach climb flight path intersects a flight path corresponding to the §/JAR 25.121(d) one-engine-inoperative approach climb gradient. The all-engines-operating go-around flight path and the §/JAR 25.121(d) one-engine-inoperative approach climb gradient flight path originate from a common point on a 2.5 degree approach path. The time interval from the point of simultaneous engine and APR system failure to the intersection of these flight paths must be no shorter than the time interval from V_{EF} to a height of 400 feet above the takeoff/take-off surface during a takeoff/take-off (ref. §/JAR 25.111(c)(4).

(c) The critical time interval must be determined at the altitude resulting in the longest critical time interval for which one-engine-inoperative approach climb performance data are presented in the Airplane Flight Manual.



* This time interval must be no shorter than the time interval from V_{EF} to a height of 400 feet during takeoff.

Figure A

#8 - ANM-00-320-A

See ANM-00-089-A NPRM pub 5/8/02

PPIHWG Report - Harmonization Proposal for 25. 1141

***NOTE**: The only FAR/JAR harmonization issues associated with FAR/JAR 25.1141 pertain to* ***paragraph 25.1141(f)**. Consequently, the scope of this report and the associated harmonization tasking is limited to that paragraph.*

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1. What is the underlying safety issue addressed by FAR/JAR? ***[Explain the underlying safety rationale for the requirement. Why does the requirement exist?]***

FAR/JAR 25.1141(f) is intended to mitigate the potential for flight crews to select an inappropriate position for, or be unaware of the position of, powerplant valves controlled from the cockpit.

2. What are the current FAR and JAR standards? *[Reproduce the FAR and JAR rules text as indicated below.]*

FAR Sec. 25.1141 - Powerplant controls: general.

* * * *

(f) Powerplant valve controls located in the cockpit must have--

(1) For manual valves, positive stops or in the case of fuel valves suitable index provisions, in the open and closed position; and

(2) For power-assisted valves, a means to indicate to the flight crew when the valve--

(i) Is in the fully open or fully closed position; or

(ii) Is moving between the fully open and fully closed position.

JAR 25.1141 Powerplant controls: general

* * * *

(f) Powerplant valve controls located in the cockpit must have -

(1) For manual valves, positive stops or in the case of fuel valves suitable index provisions, in the open and closed positions; and

(2) In the case of valves controlled from the cockpit other than by mechanical means, where the correct functioning of such a valve is essential for the safe operation of the aeroplane, a valve position indicator operated by a system which senses directly that the valve has attained the position selected, unless other indications in the cockpit give the flight crew a clear indication that the valve has moved to the selected position. (See ACJ 25.1141(f).)

ACJ 25.1141(f) - Powerplant Controls, General (Interpretative Material)

A continuous indicator need not be provided.

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3. What are the differences in the standards and what do these differences result in? *[Explain the differences in the standards, and what the differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]*

The significant regulatory difference exist is in sub-paragraph (f)(2) where:

- The FAR uses the term "power assisted" and the JAR uses "other than by mechanical means" to describe applicability;
- The JAR uses the phrase "where the correct functioning of such a valve is essential for the safe operation of the aeroplane" to reduce the applicability to be more consistent with JAR 25.1309(c) requirements for indications, the FAR does not; and
- The basic indicating requirement of the FAR and JAR are also different. While the JAR uses "a valve position indicator operated by a system which senses directly that the valve has attained the position selected", the FAR uses "a means to indicate to the flight crew when the valve is in the fully open or fully closed position, or is moving between the fully open and fully closed position"; and
- Lastly, by including: " unless other indication in the cockpit give the flight crew a clear indication that the valve has moved to the selected position", the JAR specifically acknowledges that a dedicated indication is not required. The FAR does not.

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4. What, if any, are the differences in the means of compliance? *[Provide a brief explanation of any differences in the compliance criteria or methodology, including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]*

The only identified significant differences in the means of compliance are those associated with the differences in the scope of rule applicability.

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5. What is the proposed action? *[Is the proposed action to harmonize on one of the two standards, a mixture of the two standards, propose a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen.]*

While ARAC was tasked with "enveloping" the FAR and JAR versions of this rule, ARAC has concluded that a more objective and effective alternative to either rule should be proposed along with suitable preamble material. This alternative proposed standard more clearly reflects the existing practices that have been found to achieve an acceptable level of safety. ARAC will also provide an alternative proposal which simply "envelopes" the two rules as called for in the tasking.

6. **What should the harmonized standard be?** [***Insert the proposed Text of the harmonized standard here.***]

The preferred proposal for a harmonized standard is set forth below:

"25.1141 Powerplant controls: general

* * * *

(f) Powerplant valve controls located in the cockpit must provide the crew with means to:

(1) select each intended position of the valve;

(2) indicate the selected position of the valve; and

(3) indicate the valve has attained the selected position."

An alternative "envelope"-only proposal for a harmonized standard is set forth below:

"25.1141 Powerplant controls: general

* * * *

(f) Powerplant valve controls located in the cockpit must have -

(1) For manual valves, positive stops or in the case of fuel valves suitable index provisions, in the open and closed positions; and

(2) For power-assisted valves, a valve position indicator operated by a system which senses directly that the valve has attained the position selected, unless other indications in the cockpit give the flight crew a clear indication that the valve has moved to the selected position."

7. **How does this proposed standard address the underlying safety issues (identified under #1?** [***Explain how the proposed standard ensures that the underlying safety issue is taken care of.***]

The preferred proposed standard clarifies the existing practices that have been found to achieve an acceptable level of safety. The alternative proposal duplicates the requirements in effect today for those applicants that certify their designs to both the FAR and JAR. Since these standards are what has resulted in the existing practices, this "enveloped" standard should also be considered capable of achieving an acceptable level of safety. However, the "enveloped" standard does not reflect the existing practices as clearly and effectively as the preferred proposed standard. Consequently, additional interpretive and guidance material may be needed to make this somewhat dated and narrow rule more relevant for modern designs.

8. **Relative to the current FAR, does the proposal increase, decrease or maintain the same level of safety? Explain.** [***Explain how each element of the proposed change to the standard affects the level of safety relative to the FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.***]

Both the preferred and the alternative "enveloped" proposed standards may increase the level of safety depending upon how the current FAR is interpreted and applied to a given modern design.
The *preferred* proposed standard specifically requires a means to select each intended position of the valve while the current FAR only implies this is a requirement for "manual valves". The preferred

proposed standard specifically requires a means to indicate the selected position of the valve while the current FAR only implies this is a requirement for "manual valves". The preferred proposed standard specifically requires a means to indicate the valve has attained the selected position while the current FAR only implies this is a requirement for all valves. Since the "enveloped" rule takes the more "severe" parts of both the FAR and JAR, the adoption of parts of the JAR is inherently viewed as increasing the level of safety required by the FAR. See sections 3 and 7 above.

However, neither of the proposed standards are intended to increase the level of safety provided by current design practices, only to help standardize them. See section 7 above.

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9. Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [*Since industry practice may be different that what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.*]

Maintains the current level of safety. See section 7 above.

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10. What other options have been considered and why were they not selected? *[Explain what other options were considered and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.)]*

Deleting FAR/JAR 25.1141(f) and rely on FAR/JAR 25.1309(c). However, this would reduce the overall level of safety provided by Part 25.

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11. Who would be affected by the proposed change? [*Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.*]

Primarily the regulatory authorities and the airframe manufactures.

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12. To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? *[Does the existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]*

See sections 6 and 7 above.

13. Is the existing FAA advisory material adequate? If not, what advisory material should be adopted? *[Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]*

If the preferred proposed standard and preamble materials are adopted, then no need for additional advisory material is currently foreseen. However, if the alternative "enveloped" proposed standard is adopted, then additional advisory material should be provided.

14. How does the proposed standard compare to current ICAO standard? [*Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any).*]

No counterpart ICAO standard exists.

15. Does the proposed standard affect other HWG's? *[Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]*

No.

16. What is the cost impact of complying with the proposed standard? [*Is the overall cost impact likely to be significant, and will the cost be higher or lower? Include any cost savings that would result from complying with one harmonized rule instead of the two existing standards. Explain what items affect the cost of complying with the proposed standard relative to the cost of complying with the current standard.*]

No anticipated change in cost.

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

Yes

18. 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. *[A negative answer to this question will prompt the FAA to pull the project out of the Fast Track Process and forward the issues to the FAA's Rulemaking Management Council for consideration as a "significant "project.]*

Yes

[AE1]

Mr. Ron Priddy
President, Operations
National Air Carrier Association
1100 Wilson Blvd., Suite 1700
Arlington, VA 22209

Dear Mr. Priddy:

The Federal Aviation Administration (FAA) recently completed a regulatory program review. That review focused on prioritizing rulemaking initiatives to more efficiently and effectively use limited industry and regulatory rulemaking resources. The review resulted in an internal Regulation and Certification Rulemaking Priority List that will guide our rulemaking activities, including the tasking of initiatives to the Aviation Rulemaking Advisory Committee (ARAC). Part of the review determined if some rulemaking initiatives could be addressed by other than regulatory means, and considered products of ARAC that have been or are about to be forwarded to us as recommendations.

The Regulatory Agenda will continue to be the vehicle the FAA uses to communicate its rulemaking program to the public and the U.S. government. However, the FAA also wanted to identify for ARAC those ARAC rulemaking initiatives it is considering to handle by alternative actions (see the attached list). At this time, we have not yet determined what those alternative actions may be. We also have not eliminated the possibility that some of these actions in the future could be addressed through rulemaking when resources are available.

If you have any questions, please feel free to contact Gerri Robinson at (202) 267-9678 or gerri.robinson@faa.gov.

Sincerely,

Anthony F. Fazio
Executive Director, Aviation Rulemaking Advisory Committee

Enclosure

cc:
William W. Edmunds, Air Carrier Operation Issues
Sarah MacLeod, Air Carrier/General Aviation Maintenance Issues
James L. Crook, Air Traffic Issues
William H. Schultz, Aircraft Certification Procedures Issues
Ian Redhead, Airport Certification Issues

Billy Glover, Occupant Safety Issues
John Tigue, General Aviation Certification and Operations Issues
David Hilton, Noise Certification Issues
John Swihart, Rotorcraft Issues
Roland B. Liddell, Training and Qualification Issues
Craig Bolt, Transport Airplane and Engine Issues

ARAC Projects that will be handled by Alternative Actions rather than Rulemaking

(Beta) Reverse Thrust and propeller Pitch Setting below the Flight Regime (25.1155)
Fire Protection (33.17)
Rotor Integrity--Overspeed (33.27)
Safety Analysis (33.75)
Rotor Integrity – Over-torque (33.84)
2 Minute/30 Second One Engine Inoperative (OEI) (33.XX)
Bird Strike (25.775, 25.571, 25.631)
Casting Factors (25.621)
Certification of New Propulsion Technologies on Part 23 Airplanes
Electrical and Electronic Engine Control Systems (33.28)
Fast Track Harmonization Project: Engine and APU Loads Conditions (25.361, 25.362)
Fire Protection of Engine Cowling (25.1193(e)(3))
Flight Loads Validation (25.301)
Fuel Vent System Fire Protection (Part 25 and Retrofit Rule for Part 121, 125, and 135)
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Harmonization of Airworthiness Standards Flight Rules, Static Lateral-Directional Stability, and Speed Increase and Recovery Characteristics (25.107(e)(1)(iv), 25.177©, 25.253(a)(3)(4)(50)). Note: 25.107(a)(b)(d) were enveloping tasks also included in this project—They will be included in the enveloping NPRM)
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Part V

Department of Transportation

Federal Aviation Administration

14 CFR Part 25

Miscellaneous Flight Requirements; Powerplant Installation Requirements; Public Address System; Trim Systems and Protective Breathing Equipment; and Powerplant Controls; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket Nos. FAA–2002–13859, FAA–2002–11272, FAA–2002–11271, FAA–2002–13438, FAA–2002–12244; Amendment No. 25–115]

RIN 2120–AI35

Miscellaneous Flight Requirements; Powerplant Installation Requirements; Public Address System; Trim Systems and Protective Breathing Equipment; and Powerplant Controls

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: The FAA amends the regulations governing airworthiness standards for transport category airplanes in six areas: miscellaneous flight requirements; powerplant installations; the public address system; trim systems; protective breathing equipment (PBE); and design requirements for powerplant valves controlled from the flight deck. Adoption of these amendments eliminates the regulatory differences between the airworthiness standards of the U.S. and the Joint Aviation Requirements (JAR) of Europe. Currently, airplane manufacturers must satisfy both the U.S. and European airworthiness requirements to certificate transport category airplanes in the U.S. and Europe. Because U.S. manufacturers of transport category airplanes already meet the more stringent requirements of the JAR, adoption of these amendments will not affect current industry design practices.

DATES: This amendment becomes effective August 2, 2004.

FOR FURTHER INFORMATION CONTACT: Dionne Krebs, FAA, Transport Standards Staff, ANM–110, Federal Aviation Administration, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue, SW., Renton, WA 98055–4056; telephone 425–227–2250; facsimile 425–227–1100, e-mail *dionne.krebs@faa.gov.*

SUPPLEMENTARY INFORMATION:

Availability of Rulemaking Documents

You can get an electronic copy using the Internet by:

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

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

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

You can also request a copy from the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue, SW., Washington, DC 20591 [(202) 267–9680]. Be 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 our jurisdiction. If you are a small entity and have a question regarding this document you may contact your local FAA official or the person listed under **FOR FURTHER INFORMATION CONTACT.** You can find out more about SBREFA on the Internet at *http://www.faa.gov/avr/arm/sbrefa.htm,* or by e-mailing us at *9–AWA–SBREFA@faa.gov.*

Background

This final rule responds to recommendations of the Aviation Rulemaking Advisory Committee (ARAC) submitted under the FAA's Fast Track Harmonization Program. It amends thirteen sections of the regulations governing airworthiness standards for transport category airplanes concerning: miscellaneous flight requirements; powerplant installations; the public address system; trim systems; protective breathing equipment (PBE); and design requirements for powerplant valves controlled from the flight deck. The FAA proposed these changes in five notices of proposed rulemaking (NPRM). The notices and the affected sections are listed in the table below.

Change No.	14 CFR section No.	Section title	Notice No.	**Federal Register** publication/ publication date
1	§ 25.111(c)(4)	Takeoff path.	02–01	67 FR 1846 01/14/2002
2	§ 25.147(c)(2)	Directional and lateral control (lateral control; general).		
3	§ 25.161(c)(2)	Trim (longitudinal).		
4	§ 25.161(e)	Trim (airplanes with four or more engines).		
5	§ 25.175(d)	Static longitudinal stability (landing).		
6	§ 25.945(b)(5)	Thrust or power augmentation system (fluid tanks).	02–02	67 FR 4856 01/31/2002
7	§ 25.973(d)	Fuel tank filler connection.		
8	§ 25.1181(b)	Designated fire zones; regions included.		
9	§ 25.1305(a)(7) and (d)(2)	Powerplant instruments (for all airplanes); (for turbojet engine powered airplanes)..		
10	§ 25.1423	Public address system.	02–18	67 FR 70510 11/22/2002
11	§ 25.677	Trim systems.	02–15	67 FR 61836 10/02/2002
12	§ 25.1439	Protective breathing equipment.		
13	§ 25.1141	Powerplant controls; general.	02–08	67 FR 30820 05/08/2002

In these notices you will find a history of the problems and discussions of the safety considerations supporting this rule. You also will find a discussion of the current requirements and why they do not adequately address the problem. The NPRMs refer to the ARAC recommendations upon which we relied in developing the proposed rules. The NPRMs also discuss each alternative that we considered and the reasons for rejecting the ones we did not adopt.

The background material in the NPRMs contains the basis and rationale for this rule and, except where we have specifically expanded on the background elsewhere in this preamble, supports this final rule as if it were contained here. We refer inquiries regarding the intent of the requirements to the background in the NPRMs as though it was in the final rule itself. It is therefore not necessary to repeat the background in this document.

History

Title 14 of the Code of Federal Regulations (CFR) part 25 contains the airworthiness standards for type certification of transport category airplanes. These standards apply to airplanes manufactured within the U.S. for use by U.S. registered operators, and airplanes manufactured in other countries and imported to the U.S. under a bilateral agreement. Manufacturers of transport category airplanes must show that each airplane they produce of a different type design complies with the applicable part 25 standards.

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

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

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

After beginning the first steps toward harmonization, the FAA and JAA soon realized that traditional methods of rulemaking and accommodating different administrative procedures was insufficient to make noticeable progress toward fulfilling the harmonization goal. The FAA identified the ARAC as an ideal vehicle for helping to resolve harmonization issues, and in 1992 the FAA tasked ARAC to undertake the entire harmonization effort.

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

Recently, representatives of the FAA and JAA proposed an accelerated process to reach harmonization, the ''Fast Track Harmonization Program.'' The FAA initiated the Fast Track Harmonization Program on November 26, 1999. This rulemaking has been identified as a ''fast track'' project.

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

Related Activity

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

Discussion of the Comments

Miscellaneous Flight Requirements, RIN 2120–AH39

On January 14, 2002, the FAA published a notice of proposed rulemaking (Notice No. 02–01, 67 FR 1846) entitled ''Miscellaneous Flight Requirements.'' The NPRM proposed to amend five sections of 14 CFR part 25 regarding transport category airplanes miscellaneous flight requirements. The amendments harmonize these standards with the comparable JAR–25 standards. The affected sections are:

§ 25.111(c)(4), ''Takeoff path''
§ 25.147(c)(2), ''Directional and lateral control''
§ 25.161(c)(2), ''Trim (longitudinal)''
§ 25.161(e), ''Trim (four or more engines)''
§ 25.175(d), ''Static longitudinal stability''

The FAA received one comment in response to the proposed rule. The commenter fully supports the proposal.

On November 26, 2002, the FAA published a final rule (67 FR 70812) entitled, ''1-g Stall Speed as the Basis for Compliance With Part 25 of the Federal Aviation Regulations.'' This final rule amended the airworthiness standards for transport category airplanes to redefine the reference stall speed as a speed not less than the 1-g stall speed, instead of the minimum speed obtained in a stalling maneuver. The rule became effective December 26, 2002.

Included in the amendment were changes to operating speeds in § 25.161(c)(2), and § 25.175(d)(4), to reflect the redefinition of the reference stall speed, specifically:

§ 25.161(c)(2), the expression, ''1.4 V_{S1}'' revised to read ''1.3 V_{SR1}.''
§ 25.175(d)(4), the expression, ''1.4 V_{S0}'' revised to read ''1.3 V_{SR0}.''

The FAA adopts the changes as proposed in the NPRM, Notice No. 02–01, revised to reflect the reference stall speed adopted by the 1-g stall speed final rule.

Revisions to Various Powerplant Installation Requirements for Transport Category Airplanes, RIN 2120–AH37

On January 31, 2002, the FAA published a Notice of Proposed Rulemaking (Notice No. 02–02, 67 FR 4856) entitled, ''Revisions to Various Powerplant Installation Requirements for Transport Category Airplanes.'' The FAA proposed to amend four sections of 14 CFR part 25 regarding airworthiness standards for powerplant installations on transport category airplanes. The amendments will harmonize these standards with the comparable JAR–25 standards. The affected sections are:

§ 25.945(b)(5) Thrust or power augmentation system
§ 25.973(d) Fuel tank filler connection
§ 25.1181(b) Designated fire zones; regions included
§ 25.1305(a)(7) and (d)(2) Powerplant instruments

General Comments

Three commenters responded including a U.S. airplane manufacturer, a foreign airworthiness authority, and a U.S. industry association representing many groups in the aviation industry. The U.S. airplane manufacturer agreed with the proposed rule without further comment. The other two commenters disagreed with portions of the proposal and provided the following comments and recommendations for change.

Section-by-Section Discussion

Section 25.1181(b) Designated Fire Zones; Regions Included

Comment: One commenter, a foreign airworthiness authority, opposes the inclusion of § 25.863 to the existing cross-reference list contained in § 25.1181(b). The commenter believes the agency is trying to bolster regulatory deficiencies in § 25.1185 ''Flammable fluids'' by making the general ''Flammable fluid fire protection'' requirements of § 25.863 applicable to ''Designated Fire Zones.'' The commenter suggests amending § 25.1185 rather than cross-referencing § 25.863 in § 25.1181(b). The commenter states that ''a gradual implementation of fire protection measures should be commensurate with hazards.'' The commenter believes the proposed cross-reference would lessen the distinction between the flammable fluid fire protection provisions required for ''Designated Fire Zones'' and those required for other flammable fluid leakage zones. The commenter believes that because of this loss of distinction, one could argue that meeting the general objective requirements of § 25.863 provides an equivalent level of safety to meeting the more specific prescriptive requirements of §§ 25.1185 through 25.1203. The commenter provides the following as an example:

''§ 25.863(c) If action is required to prevent or counteract a fluid fire [* * *] quick acting means must be provided to alert the crew.''

''§ 25.1203(a) There must be approved, quick acting fire or overheat detectors [* * *] in numbers and locations ensuring prompt detection of fire in those zones.''

FAA Reply: The FAA uses the following definitions in our response:

Designated Fire Zone (DFZ). The areas listed in § 25.1181:

- The engine power section;
- Except for reciprocating engines, any complete powerplant compartment in which no isolation is provided between the engine power section and the engine accessory section;
- The engine accessory section;
- The APU compartment;
- Any fuel burning heater (or combustion equipment described in § 25.859);
- The compressor and accessory sections of turbine engines; and
- The combustor, turbine and tailpipe sections of turbine engine installations that contain lines or components carrying flammable fluids.

Fire Zone. A flammable fluid leakage zone that contains a nominal ignition source and is not a DFZ.

Flammable Fluid Leakage Zone. Any area where flammable liquids or vapors are not intended to be present, but where they might exist due to leakage from flammable fluid-carrying components (*e.g.*, leakage from tanks, lines, etc.).

The purpose of the proposal is not to change the applicability of § 25.863 but rather to make it clear that § 25.863, by its wording and nature, is applicable to any area subject to flammable fluid leakage, including DFZs. The requirements of § 25.863 are applicable to DFZs in addition to, not instead of, the requirements of §§ 25.1185 through 25.1203. Consequently, applying the requirements of § 25.863 to DFZs, especially the requirement for a ''means to minimize the likelihood of ignition,'' increases the level of safety. It is neither appropriate nor necessary to repeat this existing, generally applicable requirement in § 25.1185 as proposed by the commenter.

The FAA agrees with the commenter's statement, ''a gradual implementation of fire protection measures should be commensurate with hazards.'' The ''minimization'' nature of § 25.863 accomplishes this goal. For example, § 25.863 clearly requires more fire protection measures in a fire zone, measures similar to those of a DFZ, than in a flammable fluid leakage zone. The ARAC recently submitted recommended advisory material to the FAA that provides more detailed guidance regarding what ''flammable fluid fire protection'' is acceptable when demonstrating compliance with §§ 25.863 and 25.1187. The FAA is reviewing this proposed advisory material and may publish a Notice of Availability in the **Federal Register** when the AC is issued.

Changes: No changes were made as a result of this comment.

Section 25.1305(d)(2) Powerplant Instruments

Comment: A U.S. industry association raises concerns about the human factors aspects of the proposed revision to § 25.1305(d)(2), ''Powerplant instruments.''

The proposed revision, requiring a means to indicate to the flightcrew when the thrust reversing device is not in the selected position, is in addition to the current requirement to indicate when the device is in the reverse thrust position. The commenter does not object to the aspect of the proposed change requiring an indication when the stowed position is selected and the device is not stowed. This accounts for the situation where the device is not completely in the forward thrust position, but has not reached the reverse thrust position either.

This commenter does not find the proposed change requiring an indication that the thrust reverse device is not deployed, although the deployed position is selected, would result in the anticipated safety improvement (enhanced crew awareness). In fact, the commenter contends that such indication may result in a safety reduction because flightcrews are already familiar with existing means used to notify the flightcrew of the condition of the thrust reversing device.

The commenter further notes that many current airplanes include airplane flight manual (AFM) and training procedures specifying that the crew check the reverse thrust position indication to verify reverser deployment. These procedures are also backed-up with a mechanical means that prevents application of reverse thrust above idle until the reverser is deployed. By specifying the need for an additional requirement, the proposed rule change would not allow the use of this method currently used in many airplanes and familiar to flightcrews. This commenter finds there are some safety concerns related to the human factors interaction between the flightcrew and the provision for two different thrust reverser indications. A cockpit indication that the reverser has deployed when commanded and another that it has not deployed as commanded may lead to flightcrew confusion and the potential for inappropriate crew action or response. This is particularly the case when considering previous crew experience and training on similar airplanes that do not incorporate the new indication.

Therefore, this commenter recommends one of the following actions: Conduct human factor studies to evaluate the safety benefits of the proposed change. Revise the proposed change to require an indication only when the forward thrust position is selected and the device is not in the appropriate position.

FAA Reply: The JAR 25.1305(d)(2) was identical with 14 CFR 25.1305(d)(2) until Change 5 of the JAR, dated January 1, 1979. At Change 5, the JAR added the 25.1305(d)(2)(i) requirement to indicate when the thrust reversing device is not in the selected position. During the decades of experience with the JAR requirement, none of the problems mentioned by the commenter have been noted.

The JAA further confirms that this requirement was added to provide more direct, continuous, and effective situational awareness than that provided by combining the required ''deployed'' indication and associated AFM procedures. Consequently, relying on the crew to use the lack of a reverser ''deployed'' indication to establish that the reverser has not deployed as commanded does not meet the intent of the harmonized JAR 25.1305(d)(2)(i) and 14 CFR 25.1305(d)(2)(i) requirement adopted by this rule.

Conversely, the FAA and JAA have agreed the inherent ''tactile feedback'' provided by traditional reverser/throttle interlock features can be shown to meet the intent of this rule. That is, when the pilot is unable to command reverse thrust above idle, he is inherently and continuously aware when the reverser is not in the selected position.

Changes: No changes were made as a result of this comment.

FAA Disposition of Comments: The FAA adopts the changes as proposed in the NPRM, Notice No. 02–02.

Public Address System, RIN 2120–AH30

On November 22, 2002, the FAA published a Notice of Proposed Rulemaking (Notice No. 02–18, 67 FR 70510) entitled, ''Public Address System.'' The FAA proposed to amend an airworthiness standard for the public address system on transport category airplanes to harmonize the standards with the comparable JAR–25 standards. This amendment requires that the public address system be capable of operation within 3-seconds from the time a microphone is removed from its stowage.

General Comments

The FAA received four comments. All the commenters generally support the proposed changes. These comments include five suggested changes, as discussed below.

Comment 1: The commenter, a U.S. airplane manufacturer, believes that this section, under Miscellaneous Equipment, should address only design compliance requirements. It should not address flight attendant operations. Also, they state the requirement for location and accessibility of the handset is sufficiently covered in § 25.1423(g). They suggest the following change to the language of the rule to clarify the intent of the rule as a design standard:

§ 25.1423(b) Be capable of operation within 3-seconds from the time a microphone is removed from its stowage.

FAA Reply: The FAA agrees with the commenter.

Changes: Section 25.1423(b) is changed to reflect the comment discussed above.

Comment 2: One commenter supports the proposal, but disagrees with the use of ''flight crewmember'' in the summary of the proposed rule. They believe this excludes the flight attendant, whom the proposed rule change would affect.

FAA Reply: The FAA partially agrees with this comment. The use of ''flight crewmember'' in the summary of the proposed rule might cause readers to interpret that the rule excludes flight attendants.

Changes: The language in the proposed rule, ''* * * after a flight crewmember removes the microphone from its stowage,'' is changed to read, ''* * * from the time a microphone is removed from its stowage,'' to reflect the comment as discussed above.

Comment 3: One commenter suggests that § 25.1423(g) should read, ''at each exit with an adjacent flight attendant seat.''

FAA Reply: The FAA does not concur. The commenter's proposed wording would expand the scope of the requirement to non-floor level exits, as well as any exit in excess of the number required when a flight attendant seat was installed next to it. This could actually discourage installation of flight attendant seats since doing so would require Public Address system access. In addition, the intent of this change is to harmonize requirements between the FAA and the JAA, and this proposal would result in a lack of harmonization.

Changes: No changes were made as a result of this comment.

Comment 4: One commenter suggests amending 14 CFR part 121 to reflect similar changes.

FAA Reply: The suggested changes to 14 CFR part 121 are outside the scope of this proposed rule and the fast track harmonization rulemaking activity.

Changes: No changes were made as a result of this comment.

FAA Disposition of Comments: Except as noted previously, the FAA adopts the changes as proposed in the NPRM, Notice No. 02–18.

Trim Systems and Protective Breathing Equipment, RIN 2120–AH40

On October 2, 2002, the FAA published a Notice of Proposed Rulemaking (Notice No. 02–15, 67 FR 61836) entitled, ''Trim Systems and Protective Breathing Equipment.'' The FAA proposed to amend airworthiness standards for transport category airplanes concerning trim systems and protective breathing equipment (PBE). For trim systems, the proposal would establish the minimum design standard. For PBE, the proposal would define design and installation requirements for portable and stationary protective breathing equipment. These amendments would harmonize the airworthiness standards for trim systems and PBE with those of JAR–25.

General Comments

The FAA received five comments in response to the proposal. One commenter supports the proposed rule without further comment. The other commenters generally support the proposed changes. These comments include four suggested changes, as discussed below.

Section-by-Section Discussion

Section 25.677(b) Trim Systems

Comment 1: A U.S. airplane manufacturer suggested removal or clarification of the phrase, ''adjacent to trim control.'' They state the phrase is obsolete for stabilizer trim because most airplanes no longer have mechanical trim wheels and cables.

FAA Reply: We do not agree with the commenter's suggestion. Use of the phrase, ''adjacent to trim control,'' in this regulation, requires the trim indication to be located near the actuation switch where the indication can be readily viewed by the pilot to prevent confusion and unintended operation. The phrase, ''adjacent to trim control,'' used in the broadest sense, means the trim indication must be placed somewhere near the trim actuation switch. The location should allow both trim settings and movement indications to be found easily and viewed by the pilot, in coordination with use of the switch, to prevent confusion and unintended operation.

Changes: No changes were made as a result of this comment.

Comment 2: The commenter suggests we revise the language of the rule to clarify whether the rule is applicable only to stabilizer trim, or to rudder and lateral trim as well. They state the text concerning ''safe takeoff range'' has traditionally been applied to only stabilizer trim, and not to aileron or rudder trim. However, this is not specified in the proposed rule.

FAA Reply: The FAA does not agree with the commenter's request to clarify the applicability of the rule. The FAA finds that a change is not necessary to clarify the rule. The proposed rule, as written, provides acceptable trim system requirements without providing unnecessary restrictions on future designs. Also, this represents a harmonized position with the JAA rule. The rule addresses all flight control trim systems, not just stabilizer trim. There are two ''ranges'' specified by the harmonized rule; one being the range of adjustment for all trim systems (*i.e.*, full range of travel), and the other being the range at which takeoffs have been demonstrated to be safe for the range of center of gravity positions approved for takeoff (*i.e.*, takeoff ''green band''). All trims systems must provide a clear, visible means to indicate the position of the trim device with respect to the range of adjustment. A safe takeoff range must be marked on the trim system indicator where it has been demonstrated that takeoff is safe for all center of gravity positions approved for takeoff.

Changes: No changes were made as a result of this comment.

Section 25.1439(a) Protective Breathing Equipment

Comment 3: The commenter suggests adding the language, ''other than the flight deck'' to paragraph (a) so it reads:

''In addition, portable protective breathing equipment must be installed for the use of appropriate crewmembers for fighting fires in compartments accessible in flight other than the flight deck. This includes isolated * * *''

The commenter believes the additional text clearly specifies the last sentence of proposed § 25.1439(a), which requires protective breathing equipment (PBE) for the maximum number of occupants, does NOT apply to the flight deck. The FAA has previously interpreted this part of the rule as not applying to the flight deck. However, if taken literally, the proposed requirement could apply to the flight deck, thus requiring up to four PBE's on the flight deck; this clearly is not the intent of the rule.

FAA Reply: The FAA agrees with the requested change. The first sentence of § 25.1439(a) applies to the flight deck and the last sentence applies to other compartments and not the flight deck.

Changes: Section 25.1439(a) is changed to reflect the comment discussed above.

Section 25.1439(b)(5) Protective Breathing Equipment

Comment 4: A foreign airplane manufacturer suggests the following revision to the language of § 25.1439(b)(5):

''* * * If a continuous flow open circuit protective breathing system is used, a flow rate of * * * Continuous flow open circuit systems must not increase the ambient oxygen content of the local atmosphere above that of demand systems. If a closed circuit protective breathing system is used, compliance to the performance requirements stated in Technical Standard Order (TSO) C116 for 15 minutes is considered to satisfy the required 15-minute duration at the prescribed altitude and minute volume. BTPD refers to body temperature conditions (that is, 37° C., at ambient pressure, dry).''

This commenter contends that, historically, a larger supply of oxygen was considered necessary when an open circuit continuous flow oxygen mask was used, relative to a demand oxygen mask, because the continuous flow mask has no means to adjust for a momentary inhalation rate that exceeded the continuous flow rate. Accordingly, the continuous flow rate was set higher, so the flow would be sufficient in the event of a momentary excursion.

By contrast, in a closed circuit rebreather system, in principle, the rate at which oxygen must be supplied is not equal to the breathing rate. If the closed circuit device has sufficient reservoir capacity to accommodate the demand for added breathing volume during a momentary excursion, the actual oxygen flow rate required is only the quantity necessary to replace the oxygen that was consumed by metabolic activity or lost through leakage.

In the case of TSO C116 compliant PBE, the user's breathing rate may correspond to 30 liters per minute for 15 minutes or 450 liters BTPD, but the actual oxygen flow required might be only one to two liters per minute normal temperature pressure dry (NTPD). In a closed circuit rebreather, a 600 liter oxygen supply for 15 minutes duration would be equal to a metabolic demand of 40 liters per minute, which is well outside the range of human metabolic capacity, and thus excessive. To the best of the commenter's knowledge, none of the currently certificated TSO C116 compliant portable closed circuit PBE units would be capable of delivering 600 liters of oxygen, but all would readily accommodate a breathing rate of 30 liters per minute BTPD at 8,000 feet pressure altitude.

This commenter believes the proposed language could be interpreted as requiring a closed circuit portable PBE to have an oxygen supply much larger than is necessary.

FAA Reply: The FAA partially concurs with the commenter. The intent of the existing § 25.1439(b)(5) has not changed with the proposed rule. The intent is that the PBE supply protective oxygen of 15 minutes duration per crewmember at a pressure altitude of 8,000 feet with a respiratory minute volume of 30 liters per minute BTPD.

We agree that the portion of the rule that specifies 600 liters of oxygen at 70 °F, and 760 mm. Hg., is only applicable to continuous flow open circuit protective breathing systems.

We do not agree that it is appropriate to reference the TSO C116 in the regulation. The TSO may change in the future and may not remain compatible with the part 25 regulations. Also, we do not agree that it is necessary to restrict the requirement to not increase the ambient oxygen content of the local atmosphere to only continuous flow open circuit systems. If a continuous flow system does not allow oxygen into the local atmosphere it would comply with the regulation.

Changes: To reflect the comment of this commenter, as discussed above, section 25.1439(b)(5) is changed to read:

''* * * If a continuous flow open circuit protective breathing system is used, a flow rate of 60 liters per minute * * *''

FAA Disposition of Comments: Except as noted previously, the FAA adopts the changes as proposed in the NPRM, Notice No. 02–15.

Powerplant Controls on Transport Category Airplanes, General, RIN 2120–AH65

On May 8, 2002, the FAA published a Notice of Proposed Rulemaking (Notice No. 02–08, 67 FR 30820) entitled, ''Powerplant Controls on Transport Category Airplanes, General.'' The FAA proposed to amend airworthiness standards for transport category airplanes concerning design requirements for powerplant valves controlled from the flight deck. The proposed rule would clarify the requirements for a means to select the intended position of the valve, to indicate the selected position, and to indicate if the valve has not attained the selected position. These amendments would harmonize the airworthiness standards for trim systems and PBE with those of JAR–25.

One commenter, a U.S. airplane manufacturer, responded to the proposed rule. The commenter includes two suggested changes, discussed below.

Section 25.1141(f) Powerplant Controls; General

Comment 1: The commenter states that proposed § 25.1141(f), as written, would require the ''valve controls to provide the means'' to the flightcrew. They suggest it should be revised to allow for an ''independent means'' to provide indication to the flightcrew. Also, they contend the wording, ''* * * provide the flightcrew the means to indicate, * * *'' is misleading. They suggest it should be revised to require ''a means to indicate to the flightcrew: * * *''

FAA Reply: The FAA agrees with the intent of the comment.

Changes: Section 25.1141(f) is being changed to read as follows:

(f) For powerplant valve controls located in the flight deck there must be a means for the flightcrew to select each intended position or function of the valve; and to indicate to the flightcrew: the selected position or function of the valve; and, when the valve has not responded as intended to the selected position or function.

Section 25.1141(f)(1) Powerplant Controls: General

Comment 2: The commenter suggests the deletion of § 25.1141(f)(1). They state that if paragraph (f) is revised according to their previous comment, proposed paragraph (f)(1) would be redundant to other parts of § 25.1141. They also suggest that, although it is acceptable to have redundant information in a regulation, the existing first paragraph of § 25.1141 more completely defines the requirement than does proposed paragraph (f)(1).

FAA Reply: The existing first paragraph of § 25.1141 requires ''each powerplant control'' be located, arranged, designed and marked in accordance with certain referenced general standards for ''cockpit controls.'' Neither this paragraph, nor the other standards it references would directly require powerplant valve controls located in the flight deck to provide the flightcrew with means to select each intended position or function of the valve as does the proposed revised section (f)(1). Consequently, the proposed rule is neither redundant nor does the existing first paragraph more completely define the requirement.

Changes: No changes were made as a result of this comment.

FAA Disposition of Comment: Except as noted previously, the FAA adopts the changes as proposed in the NPRM, Notice No. 02–08.

What Regulatory Analyses and Assessments Has the FAA Conducted?

Economic Assessment, Regulatory Flexibility Determination, Trade Impact Assessment, and Unfunded Mandates Assessment

Proposed changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs each Federal agency to propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (19 U.S.C. 2531–2533) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, this Trade Agreements Act also requires agencies to consider international standards and, where appropriate, use them as the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires agencies to prepare a written assessment of the costs, benefits and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local or tribal governments, in the aggregate, or by the private sector, of $100 million or more annually (adjusted for inflation).

In conducting these analyses, FAA has determined that this final rule:

1. Has benefits that do justify its costs, is not a ''significant regulatory action'' as defined in section 3(f) of Executive Order 12866, and is not ''significant'' as defined in DOT's Regulatory Policies and Procedures;

2. Will not have a significant economic impact on a substantial number of small entities;

3. Will not reduce barriers to international trade; and

4. Does not impose an unfunded mandate on state, local, or tribal governments, or the private sector.

These analyses, available in the docket, are summarized below.

The (DOT) Order 2100.5, ''Regulatory Policies and Procedures,'' prescribes policies and procedures for simplification, analysis, and review of regulations. If it is determined that the expected impact is so minimal that the rule does not warrant a full evaluation, a statement to that effect and the basis for it is included in the regulation. We provide the basis for this minimal impact determination below. We received no comments that conflicted with the economic assessment of minimal impact published in the notices of proposed rulemaking for this action. Given the reasons presented below, and the fact that no comments were received to the contrary, we have determined that the expected impact of this rule is so minimal that the final rule does not warrant a full evaluation.

Currently, airplane manufacturers must satisfy both the 14 CFR and the European JAR requirements to certificate transport category airplanes in both the United States and Europe. Meeting two sets of certification requirements raises the cost of developing a new transport category airplane, often with no increase in safety. In the interest of fostering international trade, lowering the cost of aircraft development, and making the certification process more efficient, the FAA, JAA, and aircraft manufacturers have been working to create a single set of certification requirements accepted in both the United States and Europe. These efforts are referred to as harmonization. This final rule results from the FAA's acceptance of ARAC harmonization working group recommendations. Members of the ARAC working groups agreed that the requirements of this rule will not impose additional costs to U.S. manufacturers of part 25 airplanes.

Specifically, this rule requires:

1. Revising §§ 25.111, 25.147, 25.161, and 25.175 to incorporate the more stringent requirements currently in those same sections of JAR–25;

2. Revising §§ 25.945, 25.973, 25.1181, and 25.1305 to meet the more stringent requirements of the parallel JAR;

3. Revising § 25.1423 to require that the public address system must be capable of operation within 3-seconds from the time a microphone is removed from its stowage;

4. Revising § 25.677 and 25.1439 to establish the minimum design standard for trim systems, to define design and installation requirements for portable and stationary protective breathing equipment, to eliminate the regulatory differences between the airworthiness standards of the U.S. and the Joint Aviation Requirements (JAR) of Europe; and,

5. Revising § 25.1141 to clarify the requirements for a means to select the intended position of the valve, and to indicate if the valve has not attained the selected position, for powerplant valves controlled from the flight deck.

Because this rule will not reduce or increase the requirements beyond those already met by U.S. manufacturers to satisfy European airworthiness standards, we have determined there will be no cost associated with this rule to part 25 manufacturers. We have not tried to quantify the benefits of this amendment beyond identifying the expected harmonization benefit. This amendment eliminates an identified significant regulatory difference (SRD) between part 25 and JAR–25 wording. Eliminating the SRD will provide for a more consistent interpretation of the rules and thus is an element of the potentially large cost savings of harmonization.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) directs the FAA to fit regulatory requirements to the scale of the business, organizations, and governmental jurisdictions subject to the regulation. We are required to determine whether a proposed or final action will have a ''significant economic impact on a substantial number of small entities'' as they are defined in the Act.

If we find that the action will have a significant impact, we must do a ''regulatory flexibility analysis.'' If, however, we find that the action will not have a significant economic impact on a substantial number of small entities, we are not required to do the analysis. In this case, the Act requires that we include a statement that provides the factual basis for our determination.

We have determined that this amendment will not have a significant economic impact on a substantial number of small entities for two reasons:

First, the net effect of the rule is regulatory cost relief. The amendment requires that new transport category airplane manufacturers meet just the ''more stringent'' European certification requirement, rather than both the United States and European standards. Airplane manufacturers already meet this standard, as well as the existing part 25 requirement.

Second, all United States manufacturers of transport category airplanes exceed the Small Business Administration small entity criteria of 1,500 employees for airplane manufacturers. Those U.S. manufacturers include: The Boeing Company, Cessna Aircraft Company, Gulfstream Aerospace, Learjet (owned by Bombardier Aerospace), Lockheed Martin Corporation, McDonnell Douglas (a wholly owned subsidiary of The Boeing Company), Raytheon Aircraft, and Sabreliner Corporation.

The FAA received no comments that differed with the assessment given in this section. Since this final rule is minimally cost-relieving and there are no small entity manufacturers of part 25 airplanes, the FAA Administrator certifies that this rule will not have a significant economic impact on a substantial number of small entities.

Trade Impact Assessment

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

The FAA has assessed the potential effect of this rulemaking and has determined that it is consistent with the statute's requirements by using European international standards as the basis for U.S. standards and supports the Administration's policy on free trade.

Unfunded Mandates Assessment

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

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

What Other Assessments Has the FAA Conducted?

Paperwork Reduction Act

Under the provisions of the Paperwork Reduction Act of 1995, there are no current or new requirements for information collection associated with this final rule.

International Compatibility

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

Executive Order 13132, Federalism

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

Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the Administrator, when modifying regulations in Title 14 of the CFR in a manner affecting intrastate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish such regulatory distinctions as he or she considers appropriate. Because this final rule applies to the certification of future designs of transport category airplanes and their subsequent operation, it could affect intrastate aviation in Alaska. Because no comments were received regarding this regulation affecting intrastate aviation in Alaska, we will apply the rule in the same way that it is being applied nationally.

Plain English

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

- Are the requirements clearly stated?
- Do the regulations contain unnecessary technical language or jargon that interferes with their clarity?
- Would the regulations be easier to understand if they were divided into more (but shorter) sections?
- Is the description in the preamble helpful in understanding the regulations?

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

Environmental Analysis

FAA Order 1050.1E identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. The FAA has determined this rulemaking action qualifies for the categorical exclusion identified in paragraph 312f and involves no extraordinary circumstances.

Regulations that Significantly Affect Energy Supply, Distribution, or Use

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

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements, Safety, Transportation.

The Amendment

■ In consideration of the foregoing, the Federal Aviation Administration amends part 25 of title 14, Code of Federal Regulations as follows:

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

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

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

■ 2. Amend § 25.111 by revising paragraph (c)(4) to read as follows:

§ 25.111 Takeoff path.

* * * * *

(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.

* * * * *

■ 3. Amend § 25.147 by redesignating paragraphs (d) and (e) as paragraphs (e) and (f), and by adding a new paragraph (d) to read as follows:

§ 25.147 Directional and lateral control.

* * * * *

(d) Lateral control; roll capability. With the critical engine inoperative, roll response must allow normal maneuvers. Lateral control must be sufficient, at the speeds likely to be used with one engine inoperative, to provide a roll rate necessary for safety without excessive control forces or travel.

* * * * *

■ 4. Amend § 25.161 by revising paragraph (c)(2), and by revising paragraph (e) as follows:

§ 25.161 Trim.

* * * * *

(c) * * *

(2) Either a glide with power off at a speed not more than 1.3 V_{SR1}, or an approach within the normal range of approach speeds appropriate to the weight and configuration with power settings corresponding to a 3 degree glidepath, whichever is the most severe, with the landing gear extended, the wing flaps (i) retracted and (ii) extended, and with the most unfavorable combination of center of gravity position and weight approved for landing; and

* * * * *

(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 § 25.123(a) for the purpose of establishing the en route flight paths with two engines inoperative.

* * * * *

■ 5. Amend § 25.175 by revising paragraph (d)(4) to read as follows:

§ 25.175(d) Demonstration of static longitudinal stability.

* * * * *

(d) * * *

(4) The airplane trimmed at 1.3 V_{SR0} with—

(i) Power or thrust off, and

(ii) Power or thrust for level flight.

* * * * *

■ 6. Amend § 25.677 by revising paragraph (b) to read as follows:

§ 25.677 Trim systems.

* * * * *

(b) There must be means adjacent to the trim control to indicate the direction of the control movement relative to the airplane motion. In addition, there must be clearly visible means to indicate the position of the trim device with respect to the range of adjustment. The indicator must be clearly marked with the range within which it has been demonstrated that takeoff is safe for all center of gravity positions approved for takeoff.

* * * * *

■ 7. Add a new paragraph (b)(5) to § 25.945 to read as follows:

§ 25.945 Thrust or power augmentation system.

* * * * *

(b) * * *

(5) Each tank must have an expansion space of not less than 2 percent of the tank capacity. It must be impossible to fill the expansion space inadvertently with the airplane in the normal ground attitude.

* * * * *

■ 8. Republish the introductory text and revise paragraph (d) of § 25.973 to read as follows:

§ 25.973 Fuel tank filler connection.

Each fuel tank filler connection must prevent the entrance of fuel into any part of the airplane other than the tank itself. In addition—

* * * * *

(d) Each fuel filling point must have a provision for electrically bonding the airplane to ground fueling equipment.

■ 9. Amend section 25.1141 by revising paragraph (f) to read as follows:

§ 25.1141 Powerplant controls: general.

* * * * *

(f) For powerplant valve controls located in the flight deck there must be a means:

(1) For the flightcrew to select each intended position or function of the valve; and

(2) To indicate to the flightcrew:

(i) The selected position or function of the valve; and

(ii) When the valve has not responded as intended to the selected position or function.

■ 10. Revise paragraph (b) of § 25.1181 to read as follows:

§ 25.1181 Designated fire zones; regions included.

* * * * *

(b) Each designated fire zone must meet the requirements of §§ 25.863, 25.865, 25.867, 25.869, and 25.1185 through 25.1203.

■ 11. Republish the introductory text and revise paragraphs (a)(7) and (d)(2) of § 25.1305 to read as follows:

§ 25.1305 Powerplant instruments.

The following are required powerplant instruments:

(a) * * *

(7) Fire-warning devices that provide visual and audible warning.

* * * * *

(d) * * *

(2) A position indicating means to indicate to the flightcrew when the thrust reversing device—

(i) Is not in the selected position, and

(ii) Is in the reverse thrust position, for each engine using a thrust reversing device.

* * * * *

■ 12. Amend § 25.1423 by republishing the introductory text and revising the text of paragraph (b) to read as follows:

§ 25.1423 Public address system.

A public address system required by this chapter must—

* * * * *

(b) Be capable of operation within 3 seconds from the time a microphone is removed from its stowage.

* * * * *

■ 13. Revise § 25.1439 to read as follows:

§ 25.1439 Protective breathing equipment.

(a) Fixed (stationary, or built in) protective breathing equipment must be installed for the use of the flightcrew, and at least one portable protective breathing equipment shall be located at or near the flight deck for use by a flight crewmember. In addition, portable protective breathing equipment must be installed for the use of appropriate crewmembers for fighting fires in compartments accessible in flight other than the flight deck. This includes isolated compartments and upper and lower lobe galleys, in which crewmember occupancy is permitted during flight. Equipment must be installed for the maximum number of crewmembers expected to be in the area during any operation.

(b) For protective breathing equipment required by paragraph (a) of this section or by the applicable Operating Regulations:

(1) The equipment must be designed to protect the appropriate crewmember from smoke, carbon dioxide, and other harmful gases while on flight deck duty or while combating fires.

(2) The equipment must include—

(i) Masks covering the eyes, nose and mouth, or

(ii) Masks covering the nose and mouth, plus accessory equipment to cover the eyes.

(3) Equipment, including portable equipment, must allow communication with other crewmembers while in use. Equipment available at flightcrew assigned duty stations must also enable the flightcrew to use radio equipment.

(4) The part of the equipment protecting the eyes shall not cause any appreciable adverse effect on vision and must allow corrective glasses to be worn.

(5) The equipment must supply protective oxygen of 15 minutes duration per crewmember at a pressure altitude of 8,000 feet with a respiratory minute volume of 30 liters per minute BTPD. The equipment and system must be designed to prevent any inward leakage to the inside of the device and prevent any outward leakage causing significant increase in the oxygen content of the local ambient atmosphere. If a demand oxygen system is used, a supply of 300 liters of free oxygen at 70° F. and 760 mm. Hg. pressure is considered to be of 15-minute duration at the prescribed altitude and minute volume. If a continuous flow open circuit protective breathing system is used, a flow rate of 60 liters per minute at 8,000 feet (45 liters per minute at sea level) and a supply of 600 liters of free oxygen at 70° F. and 760 mm. Hg. pressure is considered to be of 15-minute duration at the prescribed altitude and minute volume. Continuous flow systems must not increase the ambient oxygen content of the local atmosphere above that of demand systems. BTPD refers to body temperature conditions (that is, 37° C., at ambient pressure, dry).

(6) The equipment must meet the requirements of § 25.1441.

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Ali Bahrami,

Manager, Transport Airplane Directorate, Aircraft Certification Service.

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