Federal Aviation Administration
Aviation Rulemaking Advisory Committee

Transport Airplane and Engine Issue Area
General Structures Harmonization Working Group

Task 13 – Pressurized Compartment Loads

Task Assignment

General Struct #17

#3

operation, and the ways in which such operations will affect such maps. The Act requires such maps to be developed in consultation with interested and affected parties in the local community, government agencies, and persons using the airport.

An airport operator who has submitted Noise Exposure Maps that are found by FAA to be in compliance with the requirements of FAR Part 150, promulgated pursuant to Title I of the Act, may submit a Noise Compatibility Program for FAA approval which sets forth the measures the operator has taken or proposes for the reduction of existing noncompatible uses and for the prevention of the introduction of additional noncompatible uses.

The FAA has completed its review of the Noise Exposure Map and supporting documentation submitted by the city of Phoenix. The specific maps under consideration are Exhibit 1, "1999 Noise Exposure Map" and Exhibit 2, "2004 Noise Exposure Map" in the submission. The FAA has determined that these maps for the Phoenix Sky Harbor International Airport are in compliance with applicable requirements. This determination is effective on October 10, 2000. FAA's acceptance of an airport operator's Noise Exposure Maps is limited to a finding that the maps were developed in accordance with the procedures contained in Appendix (A) of FAR Part 150. Such acceptance does not constitute approval of the applicant's data, information or plans, or a commitment to approve a Noise Compatibility Program or to fund the implementation of that program.

If questions arise concerning the precise relationship of specific properties to noise exposure contours depicted on a Noise Exposure Map, submitted under Section 103 of the Act, it should be noted that the FAA is not involved in any way in determining the relative locations of specific properties with regard to the depicted noise contours, or in interpreting the Noise Exposure Maps to resolve questions concerning, for example, which properties should be covered by the provisions of Section 107 of the Act. These functions are inseparable from the ultimate land use control and planning responsibilities of local government. These local responsibilities are not changed in any way under FAR Part 150 through FAA's review of the Noise Exposure Maps. Therefore, the responsibility for the detailed overlaying of noise exposure contours onto the map depicting properties on the surface rests exclusively with the airport operator which submitted those maps, or with those public agencies and planning agencies with which consultation is required under Section 103 of the Act. The FAA has relied on the certification by the airport operator, under Section 150.21 of FAR Part 150, that the statutorily required consultation has been accomplished.

Copies of the Noise Exposure Maps and of the FAA's evaluation of the maps are available for examination at the following locations:

Federal Aviation Administration, 800 Independence Avenue, SW., Room 617, Washington, DC 20591;

Federal Aviation Administration, Western-Pacific Region, Airports Division, AWP–600, 15000 Aviation Boulevard, Hawthorne, CA 90261; and

City of Phoenix, Aviation Department, 3400 Sky Harbor Boulevard, Phoenix, AZ 85034.

Questions may be directed to the individual named above under the heading **FOR FURTHER INFORMATION CONTACT.**

Issued in Hawthorne, California on October 10, 2000.

Herman C. Bliss,

Manager, Airports Division, AWP–600, Western-Pacific Region.

[FR Doc. 00–27334 Filed 10–24–00; 8:45 am]

BILLING CODE 4910–13–M

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee Transport Airplanes and Engine Issues—New Tasks

AGENCY: Federal Aviation Administration (FAA), DOT.

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

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

FOR FURTHER INFORMATION CONTACT: Dorenda Baker, 601 Lind Ave., Renton, Washington 98055–4056, 425–227–2109, dorenda.baker@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. This includes obtaining advice and recommendations on the FAA's commitment to harmonize title 14 of the Code of Federal Regulations (14 CFR) with its partners in Europe and Canada.

The Task

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

Task: Review 14 CFR 25.365(d), in particular the factors applied to the maximum relief value setting, which is used to set a limit structural design loan. Review FAA and Joint Aviation Authority (JAA) advisory material and paragraph 8 of Advisory Circular 25–20. In light of this review, develop a report recommending changes to harmonize this section and the corresponding JAR paragraph, recommending new harmonized standards, and develop related or revised advisory material as necessary.

Schedule: The report and advisory material shall be submitted to the FAA within 18 months after the date of this notice.

ARAC Acceptance of Tasks

ARAC has accepted the tasks and has chosen to assign the tasks to the General Structures Harmonization Working Group of the ARAC Transport Airplanes and Engine Issues group. The working group will serve as staff to ARAC to assist in the analysis of the assigned tasks. 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 General Structures Harmonization 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 Engines issues held following publication of this notice.

2. Give a detailed conceptual presentation of the proposed recommendations, prior to proceeding with the work stated in item 3 below.

3. Draft appropriate documents with supporting economic and other required analyses, and/or any other related guidance material or collateral

documents the working group determines to be appropriate; or, if new or revised requirements or compliance methods are not recommended, a draft report stating the rationale for not making such recommendations.

4. Provide a status report at each meeting of the ARAC held to consider Transport Airplane and Engine issues.

The Secretary of Transportation has determined that the formation and use of the ARAC are 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 General Structures Harmonization Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on October 18, 2000.

Anthony F. Fazio,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 00–27332 Filed 10–24–00; 8:45 am]

BILLING CODE 4910–13–M

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Harmonization Initiatives

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice of public meeting.

SUMMARY: The Federal Aviation Administration and the Joint Aviation Authorities will convene a meeting to accept input from the public on the Harmonization Work Program. The Harmonization Work Program is the means by which the Federal Aviation Administration and the Joint Aviation Authorities carry out a commitment to harmonize, to the maximum extent possible, the rules regarding the certification, operation and maintenance of civil aircraft, and the standards, practices, and procedures governing the design, materials, workmanship, and construction of civil aircraft, aircraft engines, and other components. The purpose of the meeting is to provide an opportunity for the public to submit input to the Harmonization Work Program. This notice announces the date, time, location and procedures for the public meeting.

DATES: The public meeting will be held on November 28 and November 30, 2000, starting at 10:30 a.m. each day. Industry comments, presentations and proposals must be received on or before November 10, 2000.

ADDRESSES: The public meeting will be held at the Latham Hotel, 3000 M Street, NW., Washington, DC, 20007.

Persons unable to attend the meeting may mail their comments in triplicate to: Brenda Courtney, Federal Aviation Administration, Office of Rulemaking (ARM–200), 800 Independence Avenue, SW., Washington, DC 20591. You may also submit your comments to Brenda Courtney by e-mail: *brenda.courtney@faa.gov* or by facsimile at (202) 267–5075.

FOR FURTHER INFORMATION CONTACT: Requests to attend and present a statement at the meeting or questions regarding the logistics of the meeting should be directed to Brenda Courtney, Office of Rulemaking, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 267–3327, e-mail: *brenda.courtney@faa.gov;* or facsimile at (202) 267–3327.

SUPPLEMENTARY INFORMATION: Federal Aviation Administration (FAA) and the Joint Aviation Authorities (JAA) will convene a meeting to accept input from the public on the Harmonization Work Program. The meeting will be held on November 28 and November 30, 2000, at the Latham Hotel, 3000 M Street, NW., Washington, DC beginning at 10:30 a.m. each day. The agenda will include:

November 28, 2000
- Review of Action Items from the March 2000 Public Meeting
- Review of Action Items from the FAA/JAA 17th Annual Conference
- Presentations from the Public

Nobember 30, 2000
- FAA, JAA and Transport Canada News of Interest
- General Session—Response to Industry Issues and Concerns

The Latham Hotel is located in the Georgetown area of Washington, DC. It is approximately 6 blocks from the Foggy Bottom/George Washington University Metrorail Stop (blue/orange lines). The hotel is approximately 6 miles from Washington Reagan National Airport, 25 miles from Dulles International Airport, and 40 miles from Baltimore/Washington International Airport. Parking is available for $20 per night for individuals who will be lodging at the hotel. For those individuals who plan to attend the meeting, but will not stay at the hotel, parking at the hotel will be $10 per day.

For hotel reservations at the Latham Hotel, please call (202) 726–5000 or 1–800–368–5922. Conference attendees should advise the hotel that you plan to attend the "FAA/JAA Harmonization Meeting". The corporate rate offered for those attending the meeting is $129 plus 14½ percent sales tax or $147.71 per night for a single room. An additional $20 will be charged for double occupancy. Note that there is a 24-hour cancellation policy. The hotel will hold a block of rooms at this rate until October 26.

Participation at the Meeting

The FAA should receive requests from persons who wish to present oral and written statements at the public meeting no later than November 10, 2000. Statements and presentations should be provided on diskette or forwarded by e-mail to the person identified under the caption **FOR FURTHER INFORMATION CONTACT** to be made part of the official minutes of the meeting. Requests to present oral statements received after November 10 will be scheduled if time is available during the meeting.

Meeting Procedures

The following procedures are established to facilitate the meeting:

(1) There will be no admission fee or other charge to attend or to participate in the meeting. The meeting will be open to all persons who have requested in advance to present statements or who register on the day of the meeting, subject to availability of space in the meeting room.

(2) The meeting may adjourn early if scheduled speakers complete their statements in less than the time scheduled for the meeting.

(3) The FAA will try to accommodate all speakers. If the available time does not permit this, speakers generally will be scheduled on a first-come-first-served basis. However, the FAA reserves the right to exclude some speakers if necessary to present a balance of viewpoints and issues.

(4) Sign and oral interpretation can be made available at the meeting, as well as an assistive listening device, if requested at the above number listed under **FOR FURTHER INFORMATION CONTACT** at least 10 calendar days before the meeting.

(5) Representatives from FAA and JAA will preside over the meeting.

(6) The FAA and JAA will review and consider all material presented by participants at the meeting. Position papers or material presenting views or information related to proposed harmonization initiatives may be accepted at the discretion of the FAA and JAA. The FAA requests that persons participating in the meeting provide copies of all materials to be presented.

Recommendation Letter

Action: ARM
AVR-1 Signature

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Pratt & Whitney
A United Technologies Company

October 4, 2004

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

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

Subject: ARAC Submittal, Pressurized Compartment Loads

Reference: ARAC Tasking, Federal Register, October 25, 2000

Dear Nick,

The Transport Airplane and Engine Issues Group is submitting the following Working Group report to the FAA in accordance with the reference tasking. This information has been prepared by the General Structures Harmonization Working Group.

- General Structures HWG Report, Pressurized Compartment Loads, FAR/JAR 25.365(d)

The Working Group was unable to reach total consensus and one issue divided the group and could not be resolved. Individual position papers are provided on the subject of implementation altitude for additional structural requirements for high altitude flight.

Sincerely yours,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: Dionne Krebs – FAA-NWR
Mike Kaszycki – FAA-NWR
John Linsenmeyer – FAA-Washington, D.C.
Andrew Kasowski - Cessna

Acknowledgement Letter

HKJ/L

DEC 16 2004

Mr. Craig R. Bolt
Assistant Chair, Aviation Rulemaking
Advisory Committee
Pratt & Whitney
400 Main Street, Mail Stop 162-14
East Hartford, CT 06108

Dear Mr. Bolt:

Thank you for your October 4, 2004, letter transmitting a recommendation for Pressurized Compartment Loads. I understand that members of the General Structures Harmonization Working Group (GSHWG) were unable to reach total consensus on one aspect of the task (implementation altitude for additional structure requirements for high altitude flight). Consequently, position papers were included with the recommendation.

I wish to thank the Aviation Rulemaking Advisory Committee (ARAC), particularly those members associated with the Transport Airplane and Engine (TAE) Issues and the GSHWG for the resources that industry gave to develop the recommendation.

We consider the submittal of the recommendation as completion of the task, and we will close the task. The recommendation and position papers will be placed on the ARAC website at http://www.faa.gov/avr/arm/arac/index.cfm. We shall keep the committee apprised of the agency's efforts on this recommendation through the Federal Aviation Administration report at TAE meetings.

Sincerely,

Original Signed By
Margaret Gilligan

Nicholas A. Sabatini
Associate Administrator for Regulation
and Certification

U.S. Department
of Transportation

Federal Aviation
Administration

Transport Airplane Directorate
Aircraft Certification Service
Boeing Certificate Management Office
2500 East Valley Road, Suite C2
Renton, Washington 98055

Mr. Craig R. Bolt
Assistant Chair, Transport Airplane Engine Issues Group
Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Dear Mr. Bolt,

This letter is to inform you of the Federal Aviation Administration's (FAA) decision with respect to instituting a moratorium on certain Aviation Rulemaking Advisory Committee (ARAC), Transport Airplane and Engine Issues Group (TAEIG) taskings. During the November 2002 Harmonization Management Team Meeting, industry requested that the FAA consider placing a moratorium on certain lower priority ARAC taskings while the FAA, Joint Aviation Authorities (JAA) and Transport Canada (TCCA), worked to develop a joint rulemaking priority list. Industry requested this moratorium to conserve resources until a final rulemaking priority list could be implemented.

The FAA agreed with industry's request and has worked with the JAA and TCCA to identify appropriate ARAC TAEIG tasks to be placed under a moratorium. The taskings were identified based on the relative priority of these projects within the FAA, JAA and TCCA as well as the maturity of the project. Also, the FAA considered that addressing working groups as a whole, rather than just specific taskings, would best address industry's concern with respect to resource conservation. The working groups and taskings that have been identified for the moratorium are the following:

- General Structures Harmonization Working Group
  - 25.365(d) High Altitude Flight
  - 25.631, 25.571, 25.775 Bird Strike
  - 25.571 Fatigue and Damage Tolerance
  - 25.683 Operational Tests
  - 25.603 Material Properties
- Power plant Installations Harmonization Working Group
  - 25.903(d) Rotorburst
  - 25.975 Fuel Tank Vent Fire Protection

The FAA requests that these two working groups hold one more meeting to document the discussions, agreements, and outstanding issues or actions for each of their taskings. This information should be documented using the attached working group report format, which is typically used by working groups to document completed TAEIG harmonization recommendations for submittal to the FAA. When the reports have been completed, they should be forwarded to the TAEIG for transmittal to the FAA.

The FAA also requests that these two working groups identify the date of their last meeting, as well as a schedule for submitting their working group report to the TAEIG and FAA.

It should be noted that this moratorium only suspends the schedules and activities associated with the working groups and taskings listed above. It does not serve to disband the working groups or revoke the related taskings. Once the joint rulemaking prioritization list is finalized and implemented, the FAA will advise TAEIG as to any further action with respect to all harmonization-working groups and their respective tasks.

Any questions regarding this issue can be directed to Mr. Mike Kaszycki at 425-227-2137 or Mike.Kaszycki@faa.gov or Ms. Dionne Krebs at 425-227-2250 or Dionne.Krebs@faa.gov.

Michael Kaszycki
Manager

cc: ARM (Tony Fazio, Florence Hamn, and Effie Upshaw)

Recommendation

Cessna
A Textron Company

May 26, 2004

IN REPLY, REFER TO
L350-04-112

Mr. Craig R. Bolt
Assistant Chair, TAEIG
Pratt & Whitney
400 Main Street
East Hartford, Ct 06108

Subject: Submittal of Results of Harmonization Effort on FAR/JAR §25.365(d), Pressurized compartment loads

Dear Craig:

The General Structures Harmonization Working Group herewith submits the Working Group Report on the subject regulatory material to the TAEIG for acceptance and recommendation to the FAA.

Summary

The GSHWG submits this Working Group Report documenting the harmonization efforts of the group in regard to §25.365(d), Pressurized compartment loads.

The General Structures Harmonization Working Group, having spent three and one-half years of meetings and discussions on this subject, was unable to reach consensus on a totally harmonized set of criteria for §25.365(d), Pressurized compartment loads. One issue continues to divide the group, that being the implementation altitude for additional structural requirements for high altitude flight. The group therefore has agreed to disagree and has provided white papers attached to this working group report outlining the individual positions on this topic.

The GHWG proceeded in good faith to harmonize the material related to pressurized compartment loads and did reach tentative agreement within the GSHWG in February 2003 on changes to the rule(s) and the advisory material. However, subsequent review of the previously agreed text by members not in attendance at the February 2003 meeting resulted in disagreement on the issue of

the implementation altitude for additional structure requirements for high altitude flight. Attempts to resolve this disagreement through e-mail correspondence in the last fifteen months have been unsuccessful. Therefore, the working group has agreed to disagree and include separate position papers on this topic of disagreement to the TAEIG along with a statement that harmonization cannot be achieved within the group.

The working group report being submitted reflects the lack of harmonization achieved on this subject and provides documentation of each of the major group member positions. The GSHWG deeply regrets that harmonization could not be attained but feels that further efforts at harmonization on this subject by the group would continue to be non-productive.

Sincerely,

Andrew H. Kasowski
General Structures HWG Chairperson
316-517-6008
316-517-1820 FAX
akasowski@cessna.textron.com

Attachment A

General Structures Harmonization Working Group Report

Pressurized compartment loads
FAR/JAR §25.365(d)

Transport Airplane Directorate
<u>WG Report Format</u>
Harmonization and New Projects

1 - BACKGROUND:

- *This section "tells the story."*
- *It should include all the information necessary to provide context for the planned action. Only include information that is helpful in understanding the proposal -- no extraneous information (e.g., no "day-by-day" description of Working Group's activities).*
- *It should provide an answer for all of the following questions:*

a. <u>SAFETY ISSUE ADDRESSED/STATEMENT OF THE PROBLEM</u>

(1) What prompted this rulemaking activity (e.g., accident, accident investigation, NTSB recommendation, new technology, service history, etc.)? What focused our attention on the issue?

14 CFR Part 25 Section 25.365(d) prescribes multiplying factors to be applied to the pressurization system relief valve setting to determine the fuselage design loads. With Amendment 25-87, the FAA applied a factor of 1.67 to type designs approved for operation above 45,000 feet because of the increased risk from a depressurization event at very high altitude (the crew may become unconscious before they can get to a safe altitude). The JAR does not have this altitude factor nor does the JAA Interpretive Policy Material on this subject, INT_POL_16, issued 1 June 2003. Harmonization is needed to avoid additional work for showing compliance to the two different standards. The rule affects all airplanes with pressurized cabins that are certificated to FAR/JAR-25.

(2) What is the underlying safety issue to be addressed in this proposal?

The underlying safety issue addressed by the proposed changes is the potential exposure of crew and passengers to the effects of sudden decompression and hypoxia as a result of airframe structural failure at high altitude.

(3) What is the underlying safety rationale for the requirement?

The rationale of the proposed requirements is to reduce the likelihood of structural failures that would expose the crew and passengers to the effects of sudden decompression and hypoxia for high altitude flight by:

- requiring pressure cabin cyclic test evidence to demonstrate the absence of fatigue failures which could contribute to such conditions within the limit of validity of the inspection/maintenance program;
- increase the likelihood of discovering any potential structural failures due to fatigue that could contribute to such conditions by increasing the frequency of

inspections of the airframe components comprising the pressure boundary and accounting for physiological criteria as well as residual strength in establishing the inspection program.

(4) Why should the requirement exist?

The objective of the high altitude standards is to prevent exposing the airplane occupants to environmental conditions that would prevent the flight crew from safe flight and landing of the airplane or cause permanent physiological damage to the occupants. Higher operational altitudes could make the loss of cabin pressure due to pressure boundary fatigue failures catastrophic even though the structure remains capable of supporting flight loads. Therefore, pressure-loaded structures for high altitude operation should be designed for increased reliability in regard to fatigue.

b. CURRENT STANDARDS OR MEANS TO ADDRESS

(1) If regulations currently exist:

(a) What are the current regulations relative to this subject? (Include both the FAR's and JAR's.)

Current CFR 14 Part 25 text:

§ 25.365 Pressurized compartment loads.
(d) The airplane structure must be designed to be able to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of 1.33 for airplanes to be approved for operation to 45,000 feet or by a factor of 1.67 for airplanes to be approved for operation above 45,000 feet, omitting other loads.

Current JAR text:

JAR 25.365 Pressurised compartment loads
(d) The aeroplane structure must be strong enough to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of 1·33, omitting other loads.

Other related requirements are contained in §25.841(a) and §25.843(a).

Current CFR 14 Part 25 text:

§ 25.841 Pressurized cabins.

(a) Pressurized cabins and compartments to be occupied must be equipped to provide a cabin pressure altitude of not more than 8,000 feet at the maximum operating altitude of the airplane under normal operating conditions.
(1) If certification for operation above 25,000 feet is requested, the airplane must be designed so that occupants will not be exposed to cabin pressure altitudes in excess of 15,000 feet after any probable failure condition in the pressurization system.

(2) The airplane must be designed so that occupants will not be exposed to a cabin pressure altitude that exceeds the following after decompression from any failure condition not shown to be extremely improbable:
(i) Twenty-five thousand (25,000) feet for more than 2 minutes; or
(ii) Forty thousand (40,000) feet for any duration.
(3) Fuselage structure, engine and system failures are to be considered in evaluating the cabin decompression.

§ 25.843 Tests for pressurized cabins.

(a) *Strength test.* The complete pressurized cabin, including doors, windows, and valves, must be tested as a pressure vessel for the pressure differential specified in §25.365(d).

Current JAR text:

JAR 25.841 Pressurised cabins

(a) Pressurised cabins and compartments to be occupied must be equipped to provide a cabin pressure altitude of not more than 2438 m (8000 ft) at the maximum operating altitude of the aeroplane under normal operating conditions. If certification for operation over 7620 m (25,000 ft) is requested, the aeroplane must be able to maintain a cabin pressure altitude of not more than 4572 m (15,000 ft) in the event of any reasonably probable failure or malfunctio0n in the pressurisation system.

JAR 25.843 Tests for pressurised cabins

(a) *Strength test.* The complete pressurized cabin, including doors, windows, and valves must be tested as a pressure vessel for the pressure differential specified in JAR 25.365(d).

(b) How have the regulations been applied? (What are the current means of compliance?) If there are differences between the FAR and JAR, what are they and how has each been applied? (Include a discussion of any advisory material that currently exists.)

Currently the FAA requires demonstration of proof of strength compliance, analysis supported by test evidence (reference 25.843(a)), using an increased factor of 1.67 on fuselage pressure only load conditions for aircraft whose certified maximum operating altitude is greater than 45,000 feet. Prior to Amendment 87, this factor on fuselage pressure only loads was imposed though the use of a Special Condition for aircraft who's certified maximum operating altitude is greater than 45,000 feet. For aircraft with a maximum certified altitude equal to or less than 45,000 feet, the FAA requires demonstration of proof of strength compliance, analysis supported by test evidence, using a factor of 1.33 on fuselage pressure only load conditions. Although AC25-20 "Pressurization, Ventilation and Oxygen Systems Assessment for Subsonic Flight Including High Altitude Operation" lists 25.365(d) as a section of the FAR that it provides guidance for, no mention of a special factor on pressure only load conditions is mentioned in the advisory material. The JAA require demonstration of proof of strength compliance, analysis supported by test evidence, using a factor of 1.33 on fuselage pressure only load conditions, regardless of the aircraft maximum certified operating altitude. Similar to FAA guidance material, the JAA Interim Policy and Temporary Guidance Material, INT/POL/25/16, "Airworthiness Standards for Subsonic Transport Aeroplanes To Be Operated Above An Altitude of 41,000 Feet" makes no mention of a special factor on pressure only load conditions for the pressure vessel.

(c) What has occurred since those regulations were adopted that has caused us to conclude that additional or revised regulations are necessary? Why are those regulations now inadequate?

This discussion examines the requirements of FAR part 25.365(d) with respect to the change made at Amendment 25-87 that requires increasing the static pressure factor from 1.33 to 1.67 if operation above 45,000 feet is to be approved. The issue that motivated this change is identified along with the objective of the change and the strategy chosen to achieve it. Following this the potential impact and/or effectiveness of the strategy is examined. It is concluded that the strategy chosen is based on some questionable assumptions and consequently it is doubtful that the desired objective will be achieved.

OVERVIEW

Amendment No. 25-87 [Federal Register: June 5, 1996 (Volume 61, Number 109)] changed Reference [1] to read as follows:

(d) The airplane structure must be designed to be able to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of 1.33 for airplanes to be approved for operation to 45,000 feet or by a factor of 1.67 for airplanes to be approved for operation above 45,000 feet, omitting other loads.

Prior to this change the requirement read as follows:

(d) The airplane structure must be strong enough to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of 1.33, omitting other loads.

In both cases paragraph (d) identifies a static strength limit design condition that the airplane structure must be shown capable of. The condition is an internal cabin pressure <u>only</u> condition. The end result is that subsequent to Amendment No. 25-87 the limit design pressure condition is increased by 25% if operation is to be above 45,000 feet.

BACKGROUND

The rationale given for this change in FAR Notice of Proposed Rule Making, 14 CFR Part 25, Docket No. 26070, Notice No. 89-31, November 22, 1989 is summarized as follows:

1. "...to account for the thermal effects on structure caused by high operating speeds."
2. "...to reduce the likelihood of structural failure and, "
3. "...to limit the size of the opening if a failure occurs."

FAR Final Rule, 14 CFR Part 25, Docket No. 26070, Amendment 25-87, June 5, 1996, in the "Discussion of Comments" section, provides more insight into the thinking behind the subject change. It should first be noted that one of the reasons given in the NPRM is discounted when it is stated, "the static factor of 1.67 is not appropriate to account for thermal effects..." In reading through the docket for the final rule, it is believed that a clear Issue, Objective and Strategy emerge as discussed below.

The Issue

The final rule docket identifies the issue being addressed by the change as follows:

> "A rapid decompression at altitudes above 45,000 feet could be catastrophic to passengers."

The Objective

The objective of the change is stated fairly clearly in several places. In the final rule docket it is stated that,

> "...this (rapid decompression) must be extremely improbable; i.e., it is not expected to occur during the lifetime of an entire fleet of airplanes."

The Strategy

The strategy adopted to achieve the objective is also noted in the final rule docket. It is stated that,

> "the FAA has determined that requiring the higher safety factor of 1.67 will reduce the probability of structural failures which could result in depressurization."

The key assumption behind this strategy is noted in a written discussion prepared by FAA-TAD, dated January 17, 2001 where it is stated that the increased factor will result in reduced operating stress which will in turn reduce the likelihood of cracking and the growth rate of cracks. It is also noted that with the resulting stronger fuselage "discrete failure events might cause less damage than otherwise".

In summary the strategy adopted appears to be based on the following assumptions:
(1) Increasing the 1.33 given in paragraph (d) of §25.365 to 1.67 for operation above 45,000 feet will result in a corresponding reduction in operating stress.
(2) A reduction in operating stress will make rapid decompressions above 45,000 feet extremely improbable because of a reduced likelihood of cracking and growth rate of cracks.

IMPACT/EFFECTIVENESS OF STRATEGY

In order to evaluate the probable impact/effectiveness of the subject strategy the assumption that increasing the static factor on pressure from 1.33 to 1.67 will result in lower operating stresses will be explored.

For the majority of the acreage of a pressurized fuselage (i.e. basic skin, frame and longeron shell structure) internal stresses are dominated by differential pressure loading. Further the hoop direction stresses are roughly twice those in the axial direction (all things being equal) and hoop direction stresses for operational conditions are primarily a function of differential pressure loading only. Based on this alone it would be logical to assume that a change in the required design limit pressure condition would result in a change in operating stress. However this conclusion will only be true if this condition is sizing structure or if it changed sufficiently so that it becomes a sizing condition.

If the hoop stress, $\sigma_H = f(\Delta P, R, t, \ldots)$, then the hoop stress due to the pressure differential load corresponding to corresponding to the maximum relief valve pressure setting (ΔP_{MAX}) is denoted as $\sigma_{HMAX} = f(\Delta P_{MAX}, R, t, ..)$. This stress is commonly referred to as the "1P" stress and this term will be used herein.

The most commonly used material by far and the one with the lowest tension allowables is 2024-T3. For this material the "B" basis ultimate tension allowable is approximately 60 KSI [5]. If we consider two hypothetical fuselages which are designed to "zero margin" for the §25.365(d) low and high altitude design conditions the ultimate hoop stress level in these fuselages are be given by:

< 45,000 feet,

$$\sigma_{HULT} = (1.5)(1.33)\,\sigma_{HMAX} = 60 \text{ KSI}$$

> 45,000 feet,

$$\sigma_{HULT} = (1.5)(1.67)\,\sigma_{HMAX} = 60 \text{ KSI}$$

It follows that the 1P hoop stress for these zero margins designs would be given by:

<45,000 feet,

$$\sigma_{HMAX} = 30 \text{ KSI}$$

> 45,000 feet,

$$\sigma_{HMAX} = 24 \text{ KSI}$$

In summary if the fuselage shell was sized purely by the §25.365(d) condition and if sizing was to zero static margin we could expect 1P hoop stress levels on the order of those given above with the high altitude design running 20% lower than the low altitude design.

But, are fuselage shells typically sized by the static strength requirement of §25.365(d) to zero margin? In order to answer this question a survey of a number of pressurized airplane models was conducted to determine the range of 1P stresses that actually exist in the commercial fleet of airplanes. This review considered both large and small airplanes approved for operation at or below 45,000 feet and included models manufactured by many different OEMs. It was found that the predominate material in all models was

2024-T3 (or a derivative) and that 1P hoop stresses ranged from approximately 8 –18 KSI.

The large difference between actual 1P hoop stresses and the level that could be allowed based on static pressure design considerations indicates that sizing must be based on something else. This is consistent based on the experience with several large airplanes where the main driver for allowable 1P hoop stress level was fatigue performance. Additionally it appears that the inherent strength margins in these airplane fuselages relative to the requirements of §25.365(d) are large enough to accommodate the increase in the factor for operation above 45,000 feet without any design changes to the acreage of structure. These observations are consistent with comments received in response to the NPRM and noted in Final rule docket where it states that:

> "One commenter notes that the pressure vessel structural design is based on fatigue loads and their effect on crack propagation. Another commenter expresses the opinion that, as the justification for the margin increase is concerned with damage tolerance rather than static strength, the FAA should attack the problem through damage tolerance requirements rather than static strength. This commenter also states that the damage tolerance requirements, even at altitudes below 40,000 feet, lead to stress levels sufficiently low so that the 1.67 requirement is "likely to be complied with"."

The above observations are further reinforced by the discussion contained in Boeing correspondence (B-222B-ERM-91-112) to the FAA regarding, "Structural Comments on NPRM 89-31 and Draft AC 25-XX "High Altitude Operation of Subsonic Flight"", dated September 10, 1991. This notes that overall the tension operating stresses would not change however a small amount of structure that was compression designed would be impacted.

Based on the above it is concluded that, due to the past industry standard practice, of sizing the acreage of tension loaded fuselage structure for fatigue performance, the increase in static pressure condition factor from 1.33 to 1.67 would have little if any impact on operating stresses in the current fleet of commercial transport airplanes. Further, the limited areas that might be impacted would not be considered fatigue sensitive in the first place and thus not at risk for rapid decompression due to fatigue cracking.

Past industry practice for sizing fuselage shell structure has been driven primarily by internal OEM design criteria and not by FARs. Allowable fuselage 1P stress levels have been set based on a desire to attain model specific, OEM defined, Design Service Goals without significant fatigue cracking. Prior to amendment 25-96, the setting of stress levels based on fatigue considerations was virtually unregulated. However, even without regulation OEM standard practice has been to size fuselage tension loaded structure based on fatigue to insure a reasonable probability of achieving its advertised Design Service Goal without significant cracking. Amendment 25-96 virtually mandates this practice and thus insures that this practice will continue by making demonstration of freedom from widespread fatigue damage up to the Design Service Goal a requirement for certification. In summary, given that the subject increase in static factor would have had an insignificant impact on the existing commercial fleet it can be anticipated that impact on future designs would be even less likely.

OTHER CONSIDERATIONS

In the preceding discussion it was argued that the increase in the static pressure factor from 1.33 to 1.67 should not be expected to result in any relative reduction in operating stresses in the tension areas of fuselages. However let's assume for the moment that the static factor was increased to the point that the static design limit pressure condition started sizing the overall fuselage pressure boundary. Two very possible scenarios are discussed below. In both cases it is still doubtful that the objective, of making rapid decompression more improbable, would be attained.

In the first scenario the OEM decides to retain his traditional design (e.g. materials, frame spacing, stringer spacing, stiffening ratios, etc.) and reduce stresses as needed to meet the static requirement by adding the necessary weight. Since the stress levels were dictated by static strength and not fatigue it then follow that the DSG, LOV, SMPs, inspection thresholds, etc. would be calculated after the stress level was set based on the OEM's traditional methodology (i.e. same reduction factors, reliability levels, etc). Given this the net result would be that the likelihood of cracking on a percent of DSG or LOV basis would be the same.

In the other possible, and probably more likely, scenario the OEM decides to modify his traditional design to minimize any weight increase brought on by this new static design condition. The most obvious change would be in skin material. A higher strength alloy could be chosen (e.g. change from 2024-T3 to 7075-T6) so that no weight would have to be added and the traditional operating stress would be unchanged. The DSG, LOV, SMPs, etc. would be determined in the traditional fashion with the likelihood of cracking remaining unchanged. A potential net negative change for this scenario could be a relative increase in crack growth rate and loss of tolerance to a discrete source failure event due to the fracture properties of the higher strength alloy.

It is believed that the objective of making rapid decompressions extremely improbable is obscured when a strategy is prescribed. In hindsight a more direct approach would be to clearly state the objective in the rule and then leave it up to the OEM to show how it was going to be achieved.

CONCLUSIONS

1. It is improbable that the change in static pressure factor from 1.33 to 1.67 results in any change in fuselage operating stresses for the acreage of structure. This is because the operating stresses are set based on fatigue and damage tolerance considerations and are well below what could be allowed based solely on designing for static strength capability for 1.33 or 1.67 time the maximum relief valve setting.
2. The above conclusion is based on the significant margin, which exists between actual operating stress levels and what could be allowed from a zero static margin standpoint in the current fleet of transport airplanes. Revisions made to § 25.571 at Amendment 96 and future anticipated revisions insure that future designs will have similar margins.
3. There could be a small percentage of the structure where operating stresses would be reduced however these would be primarily local areas sized by compression where fatigue cracking would not be expected in the first place.
4. Trying to force a reduction in working stress by defining an artificially high static design condition should not be expected to reduce the likelihood of cracking or increase the tolerance to discrete failure events by itself. It is reasonable to expect an

OEM to react to this by changing the DSG, LOV, SMPs, and/or modifying the design configuration. It is likely there will be a zero net gain.

5. It would be much more effective to state the basic objective, that motivated Amendment 25-87, as a requirement than to mandate a questionable strategy.

2. *If no regulations currently exist:*

(a) What means, if any, have been used in the past to ensure that this safety issue is addressed? Has the FAA relied on issue papers? Special Conditions? Policy statements? Certification action items? Has the JAA relied on Certification Review Items? Interim Policy? If so, reproduce the applicable text from these items that is relative to this issue.

Not applicable, current rules exist.

(b) Why are those means inadequate? Why is rulemaking considered necessary (i.e., do we need a general standard instead of addressing the issue on a case-by-case basis?)?

Not applicable, current rules exist.

2. DISCUSSION of PROPOSAL

- *This section explains:*

→ *what the proposal would require,*

→ *what effect we intend the requirement to have, and*

→ *how the proposal addresses the problems identified in Background.*

- *Discuss each requirement separately. Where two or more requirements are very closely related, discuss them together.*
- *This section also should discuss alternatives considered and why each was rejected.*

a. SECTION-BY-SECTION DESCRIPTION OF PROPOSED ACTION

(1) What is the proposed action? Is the proposed action to introduce a new regulation, revise the existing regulation, or to take some other action?

After 3.5 years of meetings and discussions the group could not reach consensus on a totally harmonized set of criteria. Revised rule and advisory material were generated and agreed to with one exception, that being the implementation altitude of additional structural requirements for high altitude flight. The group therefore agrees to disagree on this one issue and has provided white papers attached to this working group report outlining the individual positions.

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements, the proposed action would be to:

a) Revise the existing regulation 25.365(d) to change the factor on pressure compartment differential pressure to 1.33 for all operational altitudes in lieu of the 1.67 factor currently specified for operation above 45,000 feet;
b) Add a new requirement for operations requested above some specified altitude, xxxxx, as 25.841(a)(4) and revise existing guidance material in AC25-20 to:
(1) require cyclic testing to demonstrate the absence of pressure boundary structural fatigue failures within limit of validity of the inspection program that would prevent the flight crew from safe flight and landing of the airplane or cause permanent physiological damage to the occupants, and
(2) establish inspections to be included in the Airworthiness Limitations Section of the Instructions for Continued Airworthiness for the pressure boundary structure based on damage tolerance analyses; and
c) Add a new requirement to 25.571(b) and reference material to AC25.571 to include the consideration of physiological effects in the damage tolerance evaluation of the fuselage pressure boundary.

(2) If regulatory action is proposed, what is the text of the proposed regulation?

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements, the proposed regulatory text would be:

§ 25.365 Pressurized compartment loads.
(d) The airplane structure must be designed to be able to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of 1.33, omitting other loads.

§ 25.841 Pressurized cabins.

(a)(4) If certification for operation above xxxxx feet is requested, additional damage-tolerance requirements are necessary to prevent fatigue damage that could result in a loss of pressure that exceeds the requirements of paragraph (a)(2) of this section. Sufficient full scale fatigue test evidence must be provided to demonstrate that this type of pressure loss due to fatigue cracking will not occur within the Limit of Validity of the Maintenance program for the airplane. In addition, a damage tolerance evaluation of the fuselage pressure boundary must be performed assuming visually detectable cracks and the maximum damage size for which the requirements of paragraph (a)(2) of this section can be met. Based on this evaluation, inspections must be established and included in the ALS of the ICA required by 25.1529.

§ 25.571 Damage-tolerance and fatigue evaluation of structure.

(b) *Damage-tolerance evaluation.*

(New additional text at the end of the paragraph)
In addition, for the fuselage pressure boundary, the damage tolerance evaluation of this paragraph must account for the requirements of paragraph (a) of section 25.841.

(3) If this text changes current regulations, what change does it make? For each change:

- What is the reason for the change?

- What is the effect of the change?

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements:

The proposed revision to the existing regulation 25.365(d) is to change the factor on pressure compartment differential pressure to 1.33 for all operational altitudes in lieu of the 1.67 factor currently specified for operation above 45,000 feet. This is coupled with the new requirements proposed for paragraph 25.841(a)(4) mandating cyclic testing to demonstrate the absence of pressure boundary structural fatigue failures within limit of validity of the inspection program that would prevent the flight crew from safe flight and landing of the airplane or cause permanent physiological damage to the occupants, and establishing that inspections be included in the Airworthiness Limitations Section of the Instructions for Continued Airworthiness for the pressure boundary structure based on damage tolerance analyses accounting for physiological effects.

The rationale of the proposed requirements is to reduce the likelihood of structural failures that would expose the crew and passengers to the effects of sudden decompression and hypoxia for high altitude flight by:

- requiring pressure cabin cyclic test evidence to demonstrate the absence of fatigue failures which could contribute to such conditions within the limit of validity of the inspection/maintenance program;
- increase the likelihood of discovering any potential structural failures due to fatigue that could contribute to such conditions by increasing the frequency of inspections of the airframe components comprising the pressure boundary and accounting for physiological criteria as well as residual strength in establishing the inspection program.

(4) If not answered already, how will the proposed action address (i.e., correct, eliminate) the underlying safety issue (identified previously)?

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements:
See rationale in 2.a(3) above.

(5) Why is the proposed action superior to the current regulations?

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements:
See logic documented in 1.b(1)(c) above.

b. <u>ALTERNATIVES CONSIDERED</u>

(1) What actions did the working group consider other than the action proposed? Explain alternative ideas and dissenting opinions.

The group in their discussions on this topic considered several alternatives. The two major alternatives considered included:

<u>Implementation Altitude</u>: Three options were considered in regard to the definition of the implementation altitude above which additional structural criteria would be required to show compliance for high altitude operations: Option (1) - 45,000 feet which is the current altitude at which additional structural requirements are specified in 25.365(d), Option (2) - 41,000 feet which is the current altitude at which additional requirements are specified in the JAA guidance material, and Option (3) – elimination of a specific altitude at which additional structural requirements are to be implemented, thus making the requirements applicable at all operating altitudes. As this issue is the one for which a harmonized position could not be reached within the group, there were dissenting opinions on all sides. Discussions of the issues surrounding this topic are contained in the white papers attached to this working group report.

Coefficient of Discharge: In the deliberations for harmonized wording for Advisory Material for high altitude operations, the validity of the default values for coefficient of discharge to be used to assess windshield/window failures as well as fuselage damage in the current AC25-20 paragraph 8.f was questioned (The default values in the AC are perceived to be un-conservative.) Research by several members of the group failed to positively confirm the origin of the values. As an alternative to specific default values, a list of references for determining discharge coefficient was proposed. Each OEM would then be on their own in providing justification to the authorities for whatever source they use in deriving Cd values employed in their analyses. In considering this option, it was felt that this guidance material could breed inconsistency within the approving agencies as well as OEMs in regard to acceptable means of Cd choice and justification. After further discussion, it was agreed that the group could support the deletion of the entire paragraph on coefficient of discharge if accompanied by a recommendation that the MSHWG, felt to be more knowledgeable on this subject, draft the appropriate guidance material to address this topic. In addition, to address the concern that the criteria currently defined by AC25-20 paragraph 8f is accepted by the FAA in showing compliance with 25.365(e), (f), and (g) (it defines structural load conditions for cabin interior bulkheads and partitions), the group recommends that a tasking be authorized to generate advisory material for 25.365(e), (f), & (g) due to the lack of such guidance (should paragraph 8.f be deleted as proposed) and the changes that are being proposed by the MSHWG to AC25-20.

Other topics in which various alternatives were discussed included the factor to establish recurring inspection intervals, mandatory modifications, rotor burst, and three lifetime fatigue tests.

(2) Why was each action rejected (e.g., cost/benefit? unacceptable decrease in the level of safety? lack of consensus? etc.)? Include the pros and cons associated with <u>each</u> alternative.
See the discussion in 2.b(1) above.

c. <u>HARMONIZATION STATUS</u>

(1) Is the proposed action the same for the FAA and the JAA?

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements, the proposed action for the FAA and JAA would have been the same.

(2) If the proposed action differs for the JAA, explain the proposed JAA action.

Not applicable.

(3) If the proposed action differs for the JAA, explain why there is a difference between FAA and JAA proposed action (e.g., administrative differences in applicability between authorities).

Not Applicable

3. COSTS AND OTHER ISSUES THAT MUST BE CONSIDERED

The Working Group should answer these questions to the greatest extent possible. What information is supplied can be used in the economic evaluation that the FAA must accomplish for each regulation. The more quality information that is supplied, the quicker the evaluation can be completed.

a. <u>COSTS ASSOCIATED WITH THE PROPOSAL</u>

(1) Who would be affected by the proposed change? How? (Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.)

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements:
Airframe manufacturers would be affected in that their new designs would be required to demonstrate compliance to an ultimate pressure factor of 1.33 for pressure vessel proof of strength rather than a factor of 1.67 for those designs whose maximum operating altitude would be above 45,000 feet. In addition, cyclic test evidence to demonstrate the absence of pressure boundary structural fatigue failures within limit of validity of the inspection program that would prevent the flight crew from safe flight and landing of the airplane or cause permanent physiological damage to the occupants would be required. Also, pressure boundary structural inspections based on damage tolerance analyses accounting for physiological effects would be required to be included in the Airworthiness Limitations Section of the Instructions for Continued Airworthiness.

Depending on the success (or lack thereof) of the pressure vessel design to meet these requirements, the airplane operators could be affected favorably or unfavorably by changes in inspection requirements.

(2) What is the cost impact of complying with the proposed regulation? Provide any information that will assist in estimating the costs (either positive or negative) of the proposed rule.

Since the group was unable to reach consensus on the issue of implementation altitude for additional structural requirements, no effort was expended to evaluate the cost impact of complying with the draft material. However, the cost impact is expected to be minimal since requirements for cyclic testing and damage tolerance evaluation of the airframe pressure vessel are included in the existing 25.571 requirements. In addition, it is felt that manufacturers would create designs that would minimize the impact on operators in regard to structural inspections.

b. OTHER ISSUES

(1) Will small businesses be affected? *(In general terms, "small businesses" are those employing 1,500 people or less. This question relates to the Regulatory Flexibility Act of 1980 and the Small Business Regulatory Enforcement Fairness Act of 1996.]*

Not applicable, no rule changes are proposed.

(2) Will the proposed rule require affected parties to do any new or additional record keeping? If so, explain. *[This question relates to the Paperwork Reduction Act of 1995.]*

Not applicable, no rule changes are proposed.

(3) Will the proposed rule create any unnecessary obstacles to the foreign commerce of the United States -- i.e., create barriers to international trade? *[This question relates to the Trade Agreement Act of 1979.]*

Not applicable, no rule changes are proposed.

(4) Will the proposed rule result in spending by State, local, or tribal governments, or by the private sector, that will be $100 million or more in one year? *[This question relates to the Unfunded Mandates Reform Act of 1995.]*

Not applicable, no rule changes are proposed.

4. ADVISORY MATERIAL

a. Is existing FAA or JAA advisory material adequate? Is the existing FAA and JAA advisory material harmonized?

FAA advisory material currently exists in the form of AC25-20, *"Pressurization, Ventilation and Oxygen Systems Assessment for Subsonic Flight Including High Altitude Operation*". JAA advisory material exists in the form of INT/POL/25/16 *"Airworthiness Standards for Subsonic Transport Aeroplanes To Be Operated Above An Altitude of 41,000 Feet"* dated June 1, 2003. These advisory material are not harmonized.

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements, the proposed changes to 25.365(d), 25.841(a)(4), and 25.571(b) would necessitate the revision of the applicable advisory material.

b. If not, what advisory material should be adopted? Should the existing material be revised, or should new material be provided?

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements, the proposed action would be to revise the existing advisory material of paragraph 8 of AC25-20 based on GSHWG discussions as proposed below to provide for a more logical approach to increase the reliability of the pressure boundary with regard to structural failures which could lead to the exposure of the airplane occupants to environmental conditions that would prevent the flight crew from safe flight and landing of the airplane or cause permanent physiological damage to the occupants. In addition, new guidance material would be included in AC25.571 to emphasize the need to address physiological considerations in the fuselage pressure boundary damage tolerance evaluation.

c. Insert the text of the proposed advisory material here (or attach), or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, Advisory Circular – Joint, policy statement, FAA Order, etc.)

Had the group been able to reach consensus on the issue of implementation altitude for additional structural requirements, the proposed advisory text would be:

Proposed revision to Paragraph 8 of Advisory Circular AC25-20 *Pressurization, Ventilation and Oxygen Systems Assessment for Subsonic Flight Including High Altitude Operation:*

8. <u>FUSELAGE STRUCTURE</u>.

a. Pressure-loaded structures for high altitude operation should be designed to reduce the possibility of decompression since higher operational altitudes could make the loss of cabin pressure due to fuselage skin cracks or other events catastrophic even though the structure remains capable of supporting flight loads.

b. Additional damage-tolerance requirements are necessary to prevent fatigue damage which could result in a rapid depressurization. To render the possibility of decompression to be extremely improbable for operations above xxxxx feet, the following should be considered:

i. Two lifetime (minimum) full scale fatigue test to provide sufficient full scale fatigue test evidence to demonstrate no rapid decompression due to fatigue cracking within the LOV. Any fatigue cracking found in the fuselage pressure boundary would have to be evaluated analogous to MSD/MED. It would need to be extrapolated by analysis/test to determine the Rapid Decompression (average behavior) point in time. This time would be divided by a factor of two to determine the required structural modification point to minimize risk of rapid decompression.

ii.The cabin altitude/time history should not exceed the limitations of § 25.841(a) after the maximum pressure vessel opening resulting from an visually detectable crack propagating for a period encompassing four inspection intervals. The evaluation should include consideration of cracks through skin-stringer and skin-frame combinations. The threshold for these types of inspections should be the period from visually detectable crack length to the critical crack length based the physiological considerations of § 25.841(a) divided by a factor of two. These inspections should be included in the Instructions for Continued Airworthiness.

c. Pressure vessel openings resulting from failure conditions such as a tire burst, wheel failure, engine rotor burst, loss of antenna, loss of stall warning vanes, etc., or any equipment failure which could result in damage to the pressure vessel, should be analyzed to determine effects on pressurization while operating at maximum cabin differential pressure if applicable.

d. The total loss of a window or windshield should be assumed unless it can be shown that total loss is extremely improbable, due to either fatigue failure or to its location with respect to likely sources of damage. Section 25.775 requires that windshields and windows be fail-safe; therefore, total loss of a window due to fatigue failure may be considered extremely improbable in regard to the requirements of 25.841(a)(2) if the window is designed fail-safe and capable of withstanding full cabin pressure in conjunction with external aerodynamic pressure as defined in AC/ACJ 25.775.

e. Consideration should be given to pressure vessel structural failures (holes or cracks) that may occur in areas of negative pressure differential, because this condition may cause the cabin altitude to exceed the airplane altitude.

Add paragraph 7j to Advisory Circular 25.571

7. DAMAGE-TOLERANCE EVALUATION.

j. *Physiological Requirements of 25.841(a)*. The crack length to be used in determining the inspection program for fuselage pressure boundaries must be the lesser of the critical crack size defined by the residual strength evaluation and the crack size shown to meet the requirements of 25.841(a).

ATTACHMENT A

FAA POSITION

FAA Position on Flight in High Altitude
Threshold Altitude

The FAA is not in favor the JAA position that rejects the threshold altitude for additional structural requirements for high altitude operation. The FAA supports the Airbus position (although flexible about 45,000 feet or 41,000 feet for the threshold). As Airbus points out in their position paper, the GSHWG proposed change to §25.571 that introduces the physiological size crack for consideration in the damage tolerance evaluation of the pressure vessel boundary is independent of altitude. Therefore, regardless of maximum operating altitude, the GSHWG proposal does address protection of the occupants from the effects of a loss of cabin pressure. The requirements the GSHWG have proposed for operations above the threshold altitude are intended to provide added confidence to the Damage Tolerance based structural inspection program. The FAA believes this is appropriate. The JAA position recognizes that risk becomes greater as the operating altitude increases and suggests that additional requirements may be necessary above 51,000 feet altitude. Furthermore, the JAA position acknowledges that some aircraft need more attention than others, based at least partially on the airplane operating altitude. The FAA believes the GSHWG proposal addresses these concerns.

ATTACHMENT B

JAA POSITION PAPER

JAA Position on Flight in High Altitude

(Hoofdorp, 22 August 2003)

The General Structures Harmonisation Working Group (GSHWG) has been tasked, in conjunction with the Mechanical Systems Harmonisation Working Group (MSHWG), to work on FAR 25 / JAR-25 harmonisation on the subject of Flight in High Altitude. As a result, the GSHWG has developed several draft recommendations for changes to paragraphs 25.365(d), 25.571(b), 25.841(a) and associated advisory material. For the full text of these draft recommendations see the Appendix to this paper.

The JAA agrees with these draft GSHWG recommendations, with **two** exceptions and **one** comment.

The **one** comment is as follows.
The proposed subparagraph 8.f.ii. of AC 25-20 states that the inspection threshold for the fuselage pressure boundary should be determined from the crack growth period from a visually detectable crack size to the critical "physiological" crack size, divided by a factor of 2. The repeat inspection interval for the fuselage pressure boundary should be determined from the crack growth period from a visually detectable crack size to the critical "physiological" crack size, divided by a factor of 4. This proposed text is however somewhat misleading. Should the thresholds and/or repeat intervals derived from 25.571 be smaller than defined by paragraph 8.f.ii, the smaller thresholds and/or repeat intervals should be taken. The JAA therefore proposes to improve the text of this subparagraph, e.g. by replacing the last sentence by: "The lesser of the inspection threshold and/or repeat inspection interval derived from either 25.571(b) or as defined in this subparagraph should be included in the Instructions for Continued Airworthiness".

The **first** exception is related to the proposed subparagraph 8.e. of AC 25-20 (copied from the existing AC 25-20). This subparagraph deals with acceptable values of coefficients of discharge (Cd's). The JAA is of the opinion that the quoted values are not sufficiently substantiated and not necessarily conservative. The JAA has reviewed the Cd's used by a range of OEM's for several a/c models. Typically, Cd's used are 0.6/0.65 and higher. There are some exceptions, where the Cd's were derived based on scale model tests, i.e. using a more rational analysis. Since advisory material is supposed to contain "conservative" means of compliance, in lieu of a more rational analysis, a Cd of 0.5 for fuselage damage as proposed does not seem to meet that objective. In addition, the proposed distinction in Cd values between fuselage damage and loss of window/windshield is not substantiated.

Therefore the JAA finds it very difficult to accept the proposed subparagraph 8.e. Two options are offered to resolve this issue:
(a) To remove subparagraph 8.e. completely. This would leave the applicants without further guidance on this subject.
(b) To revise subparagraph 8.e. as follows:

"e. In calculating the cabin altitude decompression profile, the applicant should justify the orifice discharge coefficient used in the analysis for the various types of failures considered. Sources of information on the selection of appropriate discharge coefficients include but are not limited to the following:
(1) ESDU 82009, "Compressible flow of gases".
(2) "Critical flow through sharp-edged orifices", J. Perry, 1949.

(3) "An investigation of the discharge and drag characteristics of auxiliary air outlets discharging into a transonic stream", NACA TN 3466, 1955.
(4) "On the flow of a compressible fluid through orifices", D. Jobson, Institution of Mechanical Engineers, 1955.
(5) "Calculation of flow of air and diatomic gases", C. Smith, Journal of Aeronautical Science, 1946.
(6) "Marks' Standard Handbook for Mechanical Engineers" McGraw-Hill Book Company"

The JAA is in favour of the second (b) option, since it would provide more objective guidance to the applicants, but could support (live with) option (a).

The **second** exception the JAA wishes to make to the GSHWG draft proposals is related to proposed subparagraph 25.841(a)(4) and associated advisory material (proposed subparagraph 8.f. of AC 25-20). These text define additional damage-tolerance requirements that are necessary to prevent fatigue damage that could result in a loss of pressure that exceeds the requirements of paragraph 25.841(a)(2). These additional requirements would become applicable above a certain altitude (threshold). In GSHWG meeting # 33 (see appendix) this value was proposed to be 41.000 ft. In GSHWG Meeting #34 it was proposed to change this value to 45.000 ft. The main arguments offered so far for the 41.000 ft threshold are that it matches the maximum operating altitude (MOA) for several existing aircraft, it matches some systems (e.g. oxygen supply) requirements, and it was the altitude limitation for the original Issue Papers on high altitude flight. The main argument for the 45.000 ft threshold is that it matches the current FAR 25.365(d), that requires the airplane structure to be designed to be able to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of 1.67 (in lieu of 1.33 for lower altitudes) for airplanes to be approved for operation above 45,000 feet, omitting other loads.

After careful consideration, the JAA is of the opinion that neither 41.000 ft nor 45.000 ft as threshold definition can be supported. The reasons for this position are as follows:

The proposals made in the MSHWG Final Report (August 2003) provide performance-based standards for aircraft design that must be met in order to ensure occupant survivability in the event of decompression at higher altitudes. System failure conditions not shown to be extremely improbable and certain structural failures shall not result in fatalities or permanent physiological harm. Therefore, in the MSHWG proposals the airplane must be designed so that occupants will not be exposed to a cabin pressure altitude that exceeds the following after decompression:
(i) Twenty-five thousand (25,000) feet for more than 2 minutes; or
(ii) Forty thousand (40,000) feet for any duration.
For uncontained engine failures, the Depressurisation Exposure Integral (DEI) method is proposed, again aiming at protecting human physiology following a rapid decompression.

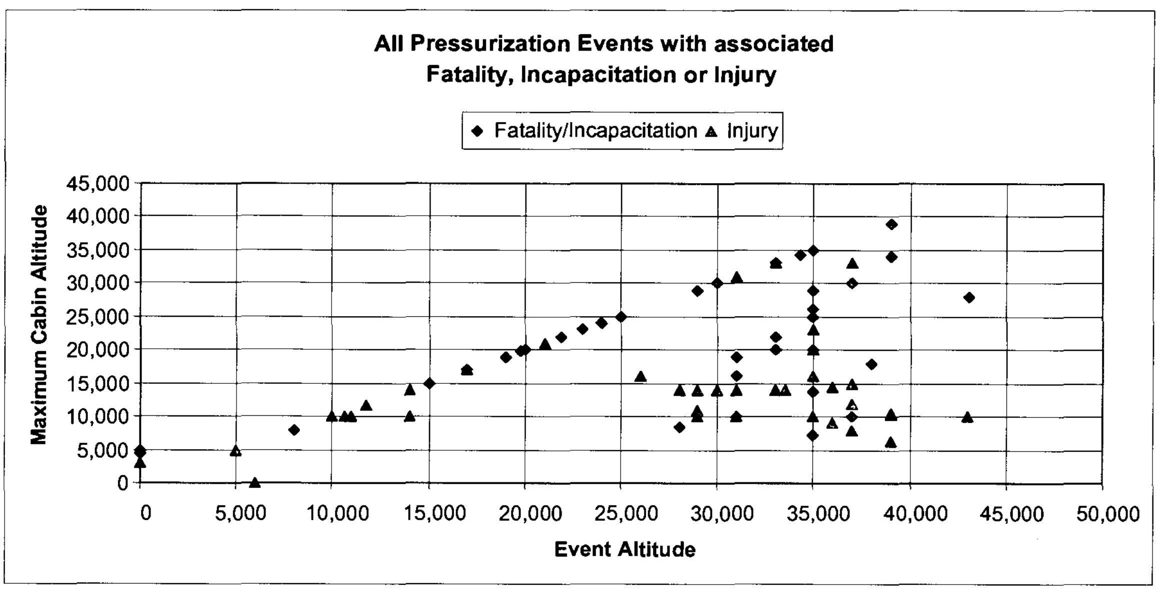
None of these (MSHWG) proposals, nor the current FAR 25.841 and AC 25-20, call out any altitude threshold (except for a maximum of 51.000 ft in relation to its applicability). The existing and proposed rules and associated advisory material are applicable to all aeroplanes, regardless of MOA. For a given aircraft design, with certain characteristics (systems configuration, compartment volumes, descent time, MOA, etc.) it will have to be shown that the existing and proposed rules can be met with certain failure scenarios that define the (fuselage) hole size to be considered.

The same principle should apply to the GSHWG proposal regarding additional damage-tolerance requirements. It would be hard to determine upfront which aeroplanes are more likely than others to pose a threat to the human physiology in a rapid decompression event. It is acknowledged that in this respect an executive jet with relatively small compartment volumes and an MOA of 51.000 ft needs more attention than a jet airliner with larger volumes and an MOA of 41.000 ft. But the JAA is of the opinion that both cases should be investigated. It would not be in the interest of safety not to investigate the rapid decompression behaviour of an aircraft with an MOA of 41.000 ft or less, knowing that a large enough hole size in the fuselage could expose the occupants to conditions exceeding the physiological limits as defined above, causing injury or death.

In other words, for this issue, the JAA does support the GSHWG proposed text for paragraphs 25.365(d), 25.571(b), 25.841(a) and associated advisory material, but with the exception of the altitude threshold of 41.000 ft. The JAA therefore wants to remove the words "for operation above 41000 feet" from these proposals to make them acceptable.

Some may argue that this position would be in excess of the current 45.000 ft threshold contained in FAR 25.365(d), would pose an undue burden on the Industry (for those aeroplanes that operate at or below 41.000 ft) and is not supported by service experience. The JAA would like to point out however that it never adopted Amendment 87 (that introduced the current FAR 25.365(d)) in JAR-25 for various reasons, including the arbitrary nature of the 45.000 ft threshold. The JAA also believes the burden on the Industry will be marginal. In accordance with the GSHWG proposal, two additional damage-tolerance considerations apply, one related to full scale fatigue test evidence and one related to definition of inspections (thresholds and repeat intervals). For the fatigue test evidence, applicants already have to comply with FAR 25.571 Amendment 96, or (in the future) the GSHWG developed 25.571 harmonised text, that already requires such full scale test evidence. Compliance demonstration to this additional consideration could therefore be limited to review of data that have to be generated anyway (and fixing of any problems of course). For the definition of inspections, the establishment of the physiological (25.841) crack size and comparison with damage-tolerance (25.571) critical crack sizes should not be a costly matter.

And as far as service experience is concerned, the data collected by the MSHWG in their Final Report (reproduced below) shows that rapid decompression events have happened at high altitude (up to 43.000 ft).



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Appendix to JAA Position on Flight in High Altitude

For reference, the following is the full text of the GSHWG draft proposals for changes to paragraphs 25.365(d), 25.571(b), 25.841(a) and associated advisory material, as developed in Meeting #33 (Hamburg).

Current Rule Text:

§25.365Pressurized compartment loads.

For airplanes with one or more pressurized compartments the following apply:

(d) The airplane structure must be designed to be able to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of 1.33 for airplanes to be approved for operation to 45,000 feet or be a factor of 1.67 for airplanes to be approved for operation above 45,000 feet, omitting other loads.

Proposed Rule Text:

§25.365Pressurized compartment loads.

For airplanes with one or more pressurized compartments the following apply:

(d) The airplane structure must be designed to be able to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of 1.33 ~~for airplanes to be approved for operation to 45,000 feet or be a factor of 1.67 for airplanes to be approved for operation above 45,000 feet~~, omitting other loads.

Proposed Rule Text:

§25.841Pressurized cabins.

(a)(4) If certification for operation above 41000 feet is requested, additional damage-tolerance requirements are necessary to prevent fatigue damage that could result in a loss of pressure that exceeds the requirements of paragraph (a)(2) of this section. Sufficient full scale fatigue test evidence must be provided to demonstrate that this type of pressure loss due to fatigue cracking will not occur within the Limit of Validity of the Maintenance program for the airplane. In addition, a damage tolerance evaluation of the fuselage pressure boundary must be performed assuming visually detectable cracks and the maximum damage size for which the requirements of paragraph (a)(2) of this section can be met. Based on this evaluation, inspections must be established and included in the ALS of the ICA required by §25.1529.

Proposed Text – AC 25-20 Paragraph 8:

8. FUSELAGE STRUCTURE.

a. Pressure-loaded structures for high altitude operation should be designed to reduce the possibility of decompression since higher operational altitudes could make the loss of cabin pressure due to fuselage skin cracks or other events catastrophic even though the structure remains capable of supporting flight loads.

b. Pressure vessel openings resulting from failure conditions such as a tire burst, wheel failure, engine rotor burst, loss of antenna, loss of stall warning vanes, etc., or any equipment failure which could result in damage to the pressure vessel, should be analyzed to determine effects on pressurization while operating at maximum cabin differential pressure if applicable.

c. The total loss of a window or windshield should be assumed unless it can be shown that total loss is extremely improbable, due to either fatigue failure or to its location with respect to likely sources of damage. Section 25.775 requires that windshields and windows be fail-safe; therefore, total loss of a window due to fatigue failure may be considered extremely improbable in regard to the requirements of §25.841(a)(2) if the window is designed fail-safe and capable of withstanding full cabin pressure in conjunction with external aerodynamic pressure as defined in AC/ACJ 25.775.

d. Consideration should be given to pressure vessel structural failures (holes or cracks) that may occur in areas of negative pressure differential, because this condition may cause the cabin altitude to exceed the airplane altitude.

e. In calculating the cabin altitude decompression profile, unless a different value can be established by a rational analysis acceptable to the FAA, an orifice discharge coefficient of $C_d = 0.75$ for loss of a window and $C_d = 0.5$ for a hole resulting from fuselage damage should be assumed.

f. Additional damage-tolerance requirements are necessary to prevent fatigue damage, which could result in a rapid depressurization. To render the possibility of decompression to be extremely improbable for operations above 41,000 feet, the following should be considered:

i. Two lifetime (minimum) full scale fatigue test to provide sufficient full scale fatigue test evidence to demonstrate that rapid decompression due to fatigue cracking will not occur within the LOV. Any fatigue cracking found in the fuselage pressure boundary would need to be extrapolated by analysis/test to determine the point of rapid decompression resulting in the exceedance of the requirements of § 25.841(a). This time would be divided by a factor of two to determine the required structural modification point to minimize risk of rapid decompression.

ii. The cabin altitude/time history should not exceed the limitations of § 25.841(a) after the maximum pressure vessel opening resulting from a visually detectable crack propagating for a period encompassing four inspection intervals. The evaluation should include consideration of cracks through skin-stringer and skin-frame combinations. If a threshold for these types of inspections is established it should be the period from visually detectable crack length to the critical crack length based the physiological considerations of § 25.841(a) divided by a factor of two. These inspections should be included in the Instructions for Continued Airworthiness.

Recommended changes for §25.571(b)

§ 25.571 Damage-tolerance and fatigue evaluation of structure.

(b) *Damage-tolerance evaluation.* The evaluation must include… has been substantiated at the time of type certification.

The extent of damage for residual strength evaluation at any time within the operational life of the airplane must be consistent with the initial detectability and subsequent growth under repeated loads

The residual strength evaluation must show that the remaining structure is able to withstand loads (considered as static ultimate loads) corresponding to the following conditions:

(1) …
(2) …
(3) …
(4) …
(5) …
(i) …
(ii) …
(6) ...

If significant changes in structural stiffness or geometry, or both, follow from a structural failure, or partial failure, the effect on damage tolerance must be further evaluated.

In addition, for the fuselage pressure boundary, the damage tolerance evaluation of this paragraph must account for the requirements of paragraph (a) of section 25.841.

Proposed Revision to AC 25.571 for Physiological Considerations

7. DAMAGE-TOLERANCE EVALUATION.

j. Physiological Requirements of §25.841(a) - The crack length to be used in determining the inspection program for fuselage pressure boundaries must be the lesser of the critical crack size defined by the residual strength evaluation and the crack size shown to meet the requirements of §25.841(a).

ATTACHMENT C

TRANSPORT CANADA POSITION

Transport Canada Position on Flight in High Altitude
Threshold Altitude

Transport Canada concurs with the JAA position accompanied by a reduction in the scatter factor from four (4) to two (2) in determining the recurring inspection interval. The removal of the factor four (4) from the inspection interval, justified in view of the same catastrophic consequences at high or low altitude, makes possible the removal of any fixed altitude threshold. Manufacturers of low altitude aircraft will not be excessively penalized because the conditions of 25.841(a)(2) can be investigated through a simple piece of software and, with time, the analysis might become even simpler and more routine.

ATTACHMENT D

AIRBUS POSITION PAPER

Airbus Position on Flight in High Altitude
Threshold Altitude

Airbus objects to the "examples" that are presented in the latest JAA Position Paper. The United Airlines B747 incident was a result of an improperly closed cargo door, whilst the Aloha Airlines B737 was due to widespread fatigue damage. Since neither of these is addressed by the proposed rule changes, they are irrelevant.

The threat that is to be addressed is that of fatigue damage in the aircraft pressure cabin that may lead to rapid decompression at high altitude. The concern is that it may not be possible to descend to a safe altitude before the loss of cabin pressure induces hypoxia in the passengers and crew, with possible fatalities or permanent physiological harm as a result.

For Airbus, the key change made by the GSHWG is the new requirement in FAR § 25.571(b), *viz.*

> *In addition, for the fuselage pressure boundary, the damage tolerance evaluation of this paragraph must account for the requirements of paragraph (a) of § 25.841.*

There is no 'threshold' altitude in this requirement; it is applicable to all aircraft, at all altitudes. The new rule would require that 'physiological' crack sizes (which are a function of the maximum operating altitude of the aircraft) are considered directly in the damage tolerance assessment, so that any inspection programmes for fatigue damage will also take account of the effects of rapid decompression. Whilst some OEMs have routinely considered the physiological crack size during the DTA, the practice is by no means universal, and the new rule may therefore impose an extra burden on some manufacturers. Nevertheless, this requirement is accepted by all the GSHWG.

However, some additional requirements have been proposed for FAR § 25.841(a) and AC 25-20, which demand that the damage tolerance assessment is supported by full-scale test evidence, *viz.*

> *Sufficient full scale fatigue test evidence must be provided to demonstrate that this type of pressure loss due to fatigue cracking will not occur within the Limit of Validity of the Maintenance program for the airplane.*
>
> *Two lifetime (minimum) full scale fatigue test to provide sufficient full scale fatigue test evidence to demonstrate that rapid decompression due to fatigue cracking will not occur within the LOV.*

and stipulate that the pressure cabin maintenance programme is based on visual inspections only, with a scatter factor of 2 used in the determination of the inspection threshold, and a scatter factor of 4 for the repeat inspection interval, *i.e.*

A damage tolerance evaluation of the fuselage pressure boundary must be performed assuming visually detectable cracks and the maximum damage size for which the requirements of paragraph (a)(2) of this section can be met.

> *The cabin altitude/time history should not exceed the limitations of § 25.841(a) after the maximum pressure vessel opening resulting from a visually detectable crack propagating for a period encompassing four inspection intervals. The evaluation should include consideration of cracks through skin-stringer and skin-frame combinations. If a threshold for these types of inspections is established it should be the period from visually detectable crack length to the critical crack length based the physiological considerations of § 25.841(a) divided by a factor of two.*

For these two additional considerations, the original GSHWG position was that there should be a threshold altitude, below which the requirements would not apply (note that the clause in FAR § 25.571(b) would still be applicable, and physiological crack sizes would still be introduced into the DTA, as mentioned above). Airbus believes that this was absolutely correct – for aircraft with a relatively low maximum operating altitude, the additional requirements would have <u>no</u> safety benefit, and would force <u>all</u> OEMs to perform additional fatigue testing and evaluations, even in cases where there was no possible threat of hypoxia.

The debate within the GSHWG, both in the last two meetings and subsequently by email, has so far been about what this threshold altitude should be. Airbus believes that the argument for 45,000 ft is correct, since the new requirements are (in part) a replacement for the existing FAR § 25.365(d) rule, which has the same threshold altitude. However, the JAA Position Paper now recommends that the threshold altitude is removed entirely. This proposal has already been debated within the GSHWG, and rejected, for the reasons given previously. Airbus does not believe that the proposed compromise position of reducing the scatter factor on the development of recurring inspections helps in this regard either; whilst Airbus totally agrees with using the same factors in setting the repeat inspection interval for high altitude operation as those used in other damage tolerance evaluations, the basic difficulty remains – with no threshold altitude, the OEM would be required to provide full scale fatigue test evidence, and consider inspections based on visually detectable cracks, even if the aircraft was never intended to operate at a high altitude.

ATTACHMENT E

OEM POSITION
(Excluding Airbus)

OEM (Excluding Airbus) Position on Flight in High Altitude
Threshold Altitude

The remaining issue in regard to attaining group consensus on our work for §25.365(d) harmonization is the altitude at which additional structural criteria (i.e. requiring pressure cabin cyclic test evidence to demonstrate the absence of fatigue failures which could contribute to such conditions within the limit of validity of the inspection/maintenance program; increase the likelihood of discovering any potential structural failures due to fatigue that could contribute to such conditions by increasing the frequency of inspections of the airframe components comprising the pressure boundary and accounting for physiological criteria as well as residual strength in establishing the inspection program) are imposed to reduce the likelihood of structural failures that would expose the crew and passengers to the effects of sudden decompression and hypoxia for high altitude flight.

The current FAA rule (§25.365(d)) and advisory material in AC25-20 establish this altitude at 45,000 feet along with the 1.67 factor on cabin pressure that the GSHWG is recommending be reduced to 1.33. However, AC25-20 also establishes the requirement for the crew to be on supplemental oxygen above 41,000 feet to minimize response time to any decompression event (Also an FAA and TC operational requirement). Indications from the other HWG working high altitude flight issues (MSHWG) are that the requirement for supplemental oxygen for the crew above 41,000 feet will remain and be recommended for inclusion by all other operational authorities. In addition, it appears the following guidance in regard to cabin occupants not being exposed to a cabin pressure altitude that exceeds the following after decompression will be retained in some form:

(i) Twenty-five thousand (25,000) feet for more than 2 minutes; or
(ii) Forty thousand (40,000) feet for any duration.

Current JAA guidance establishes high altitude requirements at 41,000 ft. Likewise, 41,000 feet was the altitude above which the several high altitude operation special conditions were imposed for general aviation business jets.

Hence the dilemma, 41K or 45K. The group discussed this issue extensively and in the last GSHWG meeting in February 2003 arrived at a tentative agreement with the exception of Airbus and the JAA, that either 41K or 45K was acceptable. Airbus felt that 45K was the correct requirement based on the current rule and advisory material and could not live with 41K. The JAA believed 41K was the correct requirement because of their existing guidance policies and materials, but were open to considering the outcome of the MSHWG work. Based on preliminary information, it appears that the MSHWG is not inclined to establish a hard limit other than that stated above in regard to the donning of crew oxygen at 41K and guidance language limiting cabin occupant exposure to altitudes less than 40K.

As the GSHWG has proposed, the consideration of cyclic test experience, damage tolerance evaluation taking into account the effects of pressure vessel damage on the cabin environment, and reduced pressure vessel inspection intervals based on these tests and evaluations are all logical means of reducing the potential exposure of crew and passengers to the effects of sudden decompression and hypoxia as a result of airframe structural failure at high altitude. It is logical that the effects of fatigue, manufacturing quality and accidental damage on the structural integrity of the pressure vessel should be assessed based on the technologies that have been established to address these phenomenon rather than an arbitrary factor on static strength. Following the logic that these enhanced precautions should be required when the consequences of the types of structural failures these precautions are trying to prevent become significant to the survival and well being of the passengers and crew, the group looked to the criteria that has been established to indicate when this would occur. As mentioned previously, the MSHWG has recommended that the existing operational requirement for supplemental oxygen to the crew be maintained when flying at altitudes above 41,000 feet. The action is recommended to minimize the effects of sudden decompression on the crew so that they can fully concentrate on taking the proper corrective actions. At altitudes below 41,000 feet, the significance of the effects of sudden decompression on the crew without supplemental oxygen in regard to executing corrective actions has been deemed to be acceptable. In addition, the MSHWG also indicate that the guidance material relating to cabin altitude profiles for all failures other than rotor burst be retained, i.e. cabin occupants not being exposed to a cabin pressure altitude that exceeds the following after decompression:

(i) Twenty-five thousand (25,000) feet for more than 2 minutes; or
(ii) Forty thousand (40,000) feet for any duration.

The additional structural requirements that the GSHWG is proposing are consistent with the proposed §25.571 requirements for cyclic testing to demonstrate the lack of WFD within the LOV of the maintenance program and consistent with the existing guidance material in AC 25-20 which does not impose an altitude limitation on the cabin environment guidance stated above.

The imposition of the additional requirements that the GSHWG has recommended in conjunction with the deletion of the 1.67 factor on the static strength pressure only case is based on a logical evaluation of the potential causes for structural failure and the consequences of flight at high altitude. In addition, the imposition of these additional requirements at some specified threshold altitude is supported logically considering when the effects of pressure vessel damage on the cabin environment and the resulting potential exposure of crew and passengers to the effects of sudden decompression and hypoxia at high altitude would occur. All of the OEMs represented on the GSHWG (including Airbus as delineated in a separate position paper) support a threshold altitude of 45,000 feet for implementation of these additional structural requirements. However, in the interest of harmonization, several of the OEM's represented on the GSHWG (excluding Airbus and Boeing) could also accept a threshold altitude of 41,000 feet.

[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)
Ground Gust Conditions (25.415)
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)
Harmonization of Part 1 Definitions Fireproof and Fire Resistant (25.1)
Jet and High Performance Part 23 Airplanes
Load and Dynamics (Continuous Turbulence Loads) (25.302, 25.305, 25.341 (b), etc.)
Restart Capability (25.903(e))
Standardization of Improved Small Airplane Normal Category Stall Characteristics Requirements (23.777, 23.781, 23.1141, 23.1309, 23.1337, 25.1305)

ATTC (25.904/App I)
Cargo Compartment Fire Extinguishing or Suppression Systems (25.851(b), 25.855, 25.857)
Proof of Structure (25.307)
High Altitude Flight (25.365(d))
Fatigue and Damage Tolerance (25.571)
Material Prosperities (25.604)